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ROYAL GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

1897.

Mo. Bot. Garden
1898.

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ROYAL GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 121.] JANUARY. [1897.

DXLI.—LIST OF KEW PUBLICATIONS, 1841–95.

The Royal Gardens, Kew, have been from their first devotion to public use the most important seat of botanical research in the United Kingdom. Sir William Hooker, the new Director of the reorganised establishment, brought with him from the University of Glasgow not merely his herbarium and library, for the reception of which West Park was rented for him by the Government, but an indefatigable assiduity in the pursuit of science and a world-wide correspondence with every botanist and traveller of his time. Under his direction Kew at once took the position of a botanical institution of the first rank. The impulse which it received from him has gathered strength with succeeding years, and its activity seems little likely to diminish under the demands made upon it from every part of the Empire.

In 1852 the Hookerian Herbarium was removed to the present building. In 1854 George Bentham, Esq., F.R.S., added to it his own herbarium and library. In 1858 the East India Company transferred to Kew the enormous collections made by their officers, which had accumulated at the India House. In 1867, after the death of Sir William Hooker, the Government purchased his library and herbarium, which thus became public property. The accommodation soon became inadequate, and in 1877 the large hall to the north was completed, the herbarium transferred to it, and the front of the original building fitted up for the library.

In 1863 Sir William Hooker projected a series of floras on an uniform plan and in the English language for India and the Colonies. The work has been steadily kept in hand ever since, and the bulk of it has been accomplished at Kew, though not in all cases by members of the staff. Of those works the most important are the "Flora Australiensis," commenced by Mr. Bentham in 1863 and completed in 1878, and the "Flora of British India," commenced in 1875 by Sir Joseph Hooker with the assistance of other botanists, which he has happily succeeded in completing since his retirement in 1885 from the post of Director. Australia and India are the only two large areas of the world the vegetation of which has been described exhaustively.

The most important work, however, which has issued from Kew is the "Genera Plantarum," which for the first time brought all the

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vast accumulations of flowering plants accessible to botanists in recent times into disciplined order. The first part was published by Mr. Bentham and Sir Joseph Hooker in 1862, and it was completed in 1883.

Another great undertaking, in some sense supplementary to this, is the "Index Kewensis." This gives down to 1885 all published names of flowering plants, with a reference to the work in which each first occurs. It was prepared by B. Daydon Jackson, Esq., Secretary of the Linnean Society, who was engaged upon its preparation for ten years, the expense being defrayed by the family of the late Charles Darwin, F.R.S. It was published by the Oxford Clarendon Press, the first part appearing in 1893 and the last in 1895.

Besides substantial works of this kind, the enormous material available at Kew has stimulated a constant stream of smaller publications either by members of the Kew staff or by other botanists working there. Of these the following pages contain a chronological catalogue which has been compiled with much pains by Mr. Daydon Jackson. It represents a volume of work which probably is not surpassed by that of any other institution in the world.

Articles of merely ephemeral interest have not been included in the list, and it is probable that some which should have been, have eluded research or have been overlooked.

The commencement of the second decade of the Kew Bulletin seemed an appropriate occasion for publishing this record of accomplished work.

W. T. T.-D.

LIST OF PUBLICATIONS.

1841.

Botanical Magazine, ed. by **W. J. Hooker**, vol. lxvii. (n. s. xiv), (in part, possibly t. 3868–3879), lxviii., t. 3880–3915.

Icones Plantarum, by **W. J. Hooker**, vol. iv. in part.

1842.

Genera Filicum, or Illustrations of the Ferns and other allied Genera; from the original coloured drawings of **Francis Bauer**, with descriptive letterpress. By **W. J. Hooker.**

Tussac Grass. By the same, Geogr. Soc. Journ., xii., pp. 265–267.

On a new *Laurus* (sub-gen. *Oreodaphne?*) from Southern Africa. By the same, Journ. Bot., iv., 418–419.

Some account of the Paraguay Tea (*Ilex paraguayensis*). By the same, Lond. Journ. Bot., i., 30–42.

On *Trichomanes Vittaria*, De Cand. By the same, l.c., 137–138.

On *Cenomyce retipora*. By the same, l.c., 292–294.

On a new Species of *Meniscium* [*M. simplex*] from China. By the same, l.c., 294–295.

On two Species of *Chrysosplenium* from extra-tropical South America. By the same, l.c., 457–459.

On a New Species of *Thuja* [*T. doniana*], and on *Podocarpus Totara* of New Zealand. By the same, l.c., 570–575.

Figures, with brief Descriptions, of three Species of *Podocarpus*. By the same, l.c., 656–659.

An Arrangement and Definition of the Genera of Ferns, with Observations on the Affinities of each Genus. By **J. Smith**, Journ. Bot., iv., 38–70, 147–198.

Contributions toward a Flora of South America. Enumeration of Plants collected by Mr. Schomburgk in British Guiana. (By G. Bentham.) Filices determined and described by **J. Smith**, Lond. Journ. Bot., i., 193–203.

An Arrangement and Definitions of the Genera of Ferns, &c. (*cont.*). By **J. Smith**, l.c., 419–438, 659–668.

Botanical Magazine, edited by **W. J. Hooker**, vol. lxviii., t. 3916–3963; lxix., t. 3964–3987.

Icones Plantarum, by the same, vol. v. (n.s. i.).

The Journal of Botany, &c., vol. iv.

The London Journal of Botany, &c., vol. i.

1843.

Brief Descriptions, with figures, of *Juniperus bermudiana*, the Pencil Cedar Tree; and of the *Dacrydium elatum*, Wall. By **W. J. H**[ooker], Lond. Journ. Bot., ii., 141–145.

Figure and Description of a new Species of *Thuja* [*T. chilensis*], from Chili. By the same, l.c., 199–200.

Notes on the Botany of the Antarctic Voyage, conducted by Captain James Clark Ross, in Her Majesty's discovery ships "Erebus" and "Terror"; with Observations on the Tussac Grass of the Falkland Islands. By **W. J. Hooker**.

Reprinted from Lond. Journ. Bot., ii., pp. 247–329, and may be regarded as a preliminary report on the botany of Ross's antarctic expedition, from the letters of Dr. J. D. Hooker, the botanist of the expedition.

Figures with brief Descriptions of two Species of *Panax*, from New Zealand. By the same, l.c., 421–423.

On *Baxteria* (of Mr. Brown), a new Genus of Plants from South Australia. By the same, l.c., 492–495.

Figure and brief Description of *Castanea chrysophylla*. By the same, l.c., 495–497.

Description of a new Species of *Drapetes*, from New Zealand. By the same, l.c., 497–498.

Figure and Description of a new Species of *Araucaria* [*A. Bidwilli*], from Moreton Bay, New Holland, detected by J. T. Bidwill, Esq. [By the same], l.c., 498–506.

Figure and Description of a new Species of *Senebiera* [*S. rhytidocarpa*] from Patagonia. By the same, l.c., 506–507.

An arrangement . . . of the Genera of Ferns, &c. By **J. Smith** (concluded), Lond. Journ. Bot., ii., 378–394.

Botanical Magazine, vol. lxix., t. 3988–4047 ; lxx., 4048–4059.

Icones Plantarum, vol. vi.

London Journal of Botany, vol. ii.

1844.

Some Account of a new *Elæodendron* from New Zealand. By **J. D. Hooker**, Lond. Journ. Bot., iii., 228–230.

Catalogue of the names of a Collection of Plants made by Mr. Wm. Stephenson, in New Zealand. By the same, l.c., 411–418.

Note on the Cider Tree (*Eucalyptus Gunnii*). By the same, l.c., 499–501.

Hepaticæ Antarcticæ; being Characters and brief Descriptions of the Hepaticæ discovered in the southern circumpolar regions during the voyage of H.M. discovery ships "Erebus" and "Terror." By the same, l.c., iii., 366–400; 454–481 (continued as Hepaticæ Novæ Zelandiæ, &c.).

Hepaticæ Novæ Zelandiæ et Tasmaniæ; being Characters and brief Descriptions of the Hepaticæ discovered in the Islands of New Zealand and Van Diemen's Land, during the voyage of H.M. discovery ships "Erebus" and "Terror," together with those collected by R. C. Gunn and W. Colenso. By the same, l.c., 556–582.

Lichenes Antarctici; being Characters and brief Descriptions of the new Lichens discovered in the southern circumpolar regions, Van Diemen's Land, and New Zealand, during the voyage of H.M. discovery ships, "Erebus" and "Terror." By the same, l.c., 634–658.

Musci Antarctici; being Characters with brief descriptions of the new species of Mosses discovered during the voyage of H.M. discovery ships, "Erebus" and "Terror," in the southern circumpolar regions, together with those of Tasmania and New Zealand. By **J. D. Hooker** and **W. Wilson**, l.c., 533–556.

Description and Figure of a new Species of *Oxalis* [*O. lindsææfolia*] from Columbia. By **W. J. Hooker**, l.c., 141–142.

Description, with a Figure, of a new Species of *Thuja* [*T. tetragona*], the Alerse of Chili. By the same, l.c., 144–148.

Some account of *Exothea oblongifolia*. By the same, l.c., 226–228.

Brief Description of a new *Notylia* [*N. multiflora*]. By the same, l.c., 315–316.

On a new Genus of Flacourtianeæ [*Lunania*] recently detected by Mr. Purdie in Jamaica. By the same, l.c., 316–318.

Enumeration of the Mosses and Hepaticæ, collected in Brazil by G. Gardner, Esq. Drawn up by **W. J. Hooker** and **W. Wilson**, l.c., 149–167.

Botanical Magazine, vol. lxx., t. 4060–4131.

Icones Plantarum, vol. vii.

London Journal of Botany, vol. iii.

1845.

The Botany of the Antarctic Voyage of H.M. discovery ships, "Erebus" and "Terror," in the years 1839–43, under the command of Captain James Clark Ross.

I. Flora antarctica. By **J. D. Hooker.**
This appeared in parts, the Preface being dated 1845.

On the Huon Pine, and on *Microcachrys*, a new Genus of Coniferæ from Tasmania; together with Remarks upon the Geographical Distribution of that Order in the Southern Hemisphere. By the same, Lond. Journ. Bot., iv., 137–157.

On *Fitchia*, a new Genus of Arborescent Compositæ (Trib. Cichoraceæ) from Elizabeth Island, in the South Pacific. By the same, l.c. 640–643.

Algæ Novæ Zelandiæ, being a Catalogue of all the species of Algæ yet recorded as inhabiting the shores of New Zealand, with Characters and brief Descriptions of the new Species discovered during the Voyage of H.M. discovery ships "Erebus" and "Terror," and of others communicated to Sir W. Hooker by Dr. Sinclair, the Rev. W. Colenso and M. Raoul. By **J. D. Hooker** and **W. H. Harvey**, l.c., 521-551.

Algæ Antarcticæ, being Characters and Descriptions of the hitherto unpublished Species of Algæ, discovered in Lord Auckland's Group, Campbell's Island, Kerguelen's Land, Falkland Islands, Cape Horn, and other southern circumpolar regions, during the voyage of H.M. discovery ships "Erebus" and "Terror." By the same, l.c., 249–276; 293–298.

Hepaticæ Antarcticæ, Supplementum, or Specific Characters with brief descriptions, of some additional Species of the Hepaticæ of the Antarctic Regions, New Zealand, and Tasmania, together with a few from the Atlantic Islands and New Holland. By **J. D. Hooker** and **T. Taylor**, l.c., 79–97.

Animadversiones in Piperaceas Herbarii Hookeriani, auctore **F. A. W. Miquel**, l.c., 410–470.

Description de deux genres nouveaux de la famille des Euphorbiacées; par **J. E. Planchon**, l.c., 471–474.

Sur les affinités des genres *Henslowia*, Wall. (*Crypteronia?* Blume. *Quilamum?* Blanco.) *Raleighia*, Gardn. et *Alzatea*, Ruiz et Pav. By the same, l.c., 474–478.

Description d'un nouveau genre de la famille des Diosmées [*Rabelaisia*]. By the same, l.c., 519–521.

Observations on a New Genus of Ferns (*Syngramma*). By **J. Smith**, l.c., 166–169.

Botanical Magazine. vol. lxxi. (1st of the 3rd series).

London Journal Botany, vol. iv.

Report . . . on the Royal Botanic Gardens and the proposed New Palm House at Kew. (House of Commons Return.)

1846.

Note on a Fossil Plant from the Fish River, South Africa. By **J. D. Hooker**, Geol. Soc. Trans., vii., 227.

Description of *Pleuropetalum*, a new Genus of Portulaceæ, from the Galapago Islands. By the same, Lond. Journ. Bot., v., 108–109.

Description of a new Genus of Compositæ (*Scleroleima*), and a New Species of *Plantago* [*P. Gunnii*], from the mountains of Tasmania. By the same, l.c., 444–447.

An Enumeration of the Plants of the Galapagos Archipelago; with descriptions of the new Species. By the same, Proc. Linn. Soc., i., (1846) 276–279.

A century of Orchidaceous Plants selected from Curtis's Botanical Magazine, with coloured figures and dissections chiefly executed by Mr. Fitch. By **W. J. Hooker.**

Species Filicum; being Descriptions of the known Ferns, particularly of such as exist in the Author's Herbarium. By the same.

Contains upwards of 300 uncoloured plates, by W. Fitch, illustrating at least 500 species of ferns.

Description d'un genre nouveau [*Purdiæa*], voisin du *Cliftonia*, avec des observations sur les affinités des *Saurauja*, des *Sarracenia*, et du *Stachyurus*. Par **J. E. Planchon**, Lond. Journ. Bot., iv. (1846), 250–256.

Revue de la Famille des Simaroubées. By the same, l.c., 560–584.

Sur le genre *Godoya* et ses analogues, avec des observations sur les Linées, des Ochnacées, et une revue des genres et espèces de ce groupe. By the same, l.c., 584–600; 644–656.

Catalogue of the first Series of Plants of Java, collected by Mr. T. Lobb, sets of which have been announced for sale by Mr. Heward, Young Street, Kensington. By the same, l.c., Lond. Journ. Bot., v., 246–250.

An Enumeration of Ferns cultivated in the Royal Gardens at Kew, in December 1845; with Characters and Observations on some of the Genera and Species. By **J. Smith**, Comp. Bot. Mag., vol. lxxii., pp. 7–39. Also as a separate pamphlet, pp. 35.

Botanical Magazine, vol. lxxii.

London Journal of Botany, vol. v.

Report . . . on the Royal Botanic Gardens and New Palm-House at Kew (for 1845), (Parl. Papers, Commons, n. 345).

1847.

Floræ Tasmaniæ Spicilegium; or Contributions towards a Flora of Van Diemen's Land. By **J. D. Hooker**, Lond. Journ. Bot., vi. 106–125; 265–286; 461bis–479 [bis].

Description of a New Species of *Lysipoma* [*L. muscoides*], from the Andes of Columbia. By the same, l.c., 286–287.

On the Diatomaceous Vegetation of the Antarctic Ocean. By the same, Rep. Brit. Assoc., 1847, ii., 83–85.

An Enumeration of the Plants of the Galapagos Archipelago; with Descriptions of those which are new. By the same, Trans. Linn. Soc., xx. (1847), 163–262.

Algæ Tasmanicæ: being a Catalogue of the Species of Algæ collected on the shores of Tasmania . . . with Characters of the new Species by **J. D. Hooker** and **W. H. Harvey**, Lond. Journ. Bot., vi., 397–417.

Description of *Victoria regia*, or Great Water-lily of South America. By **W. J. Hooker.**

This was a separate issue, on large paper, of the figures and letterpress originally published in the Botanical Magazine, plates 4275–4278. Seedlings of this plant were growing at Kew at the end of 1847, but they were never reared. (W. B. H.)

Catalogue of Mr. Geyer's Collection of Plants gathered in the Upper Missouri, the Oregon Territory, and the intervening portion of the Rocky Mountains. By **W. J. H**[**ooker**], Lond. Journ. Bot. vi. (1847), 65–79; 206–256.

Figure and Description of a new *Cardamine* from New Granada. By the same. l.c., 292–294.

Botanical Characters of a new Plant (*Isonandra Gutta*), yielding the Gutta Percha of commerce. By **W. J. H**[**ooker**], l.c., 463–465.

—— Repr. in Pharm. Journ. vii. 179–181.

—— *Transl.* Sur le Gutta Percha et la plante qui le produit. Ann. Sc. Nat. Sér. II. viii. 193–195; Journ. de Pharm. xiii. (1848), 35–36.

Botany of the Niger Expedition [in continuation of Vogel's Journal]. By **W. J. Hooker** and **J. D. Hooker.** Lond. Journ. Bot. vi., 125–139. (With list of Madeira plants by C. Lemann.)

Sur le genre *Godoya*, etc., par **J. E. Planchon,** l.c., 1–31.

Observations sur *l'Amoreuxia*, DC. (*Euryanthe*, Cham. et Schlecht) et description des nouveaux genres *Roucheria* et *Lobbia*, comme introduction à des mémoires distincts sur les Cochlospermées, Linées et Aristolochiacées, familles auxquelles ces genres seront respectivement rattachés. By the same, l.c., 139–146.

Sur le nouvelle famille des Cochlospermées. By the same, l.c., 294–311.

Sur la Famille des Linées. By the same, l.c., 588–603.

Botanical Magazine, vol. lxxiii.

The London Journal of Botany, vol. vi.

Guide to Kew Gardens, eds. I. and II. (title only differs).

Report . . [for 1846]. Parl. Papers, Commons, n. 229.

1848.

On the Vegetation of the Carboniferous Period, as compared with that of the present day. By **J. D. Hooker**, Geol. Surv. Mem., ii., 387–430; Edinb. New Phil. Journ., xlv., 362–369; xlvi., 73–78.

On some peculiarities on the Structure of *Stigmaria*. By the same, l.c., 431–439.

Remarks on the Structure and Affinities of some *Lepidostrobi*. By the same, l.c., 440–456.

[Descriptions of about 45 new Australian plants scattered through Mitchell's Journal of an Expedition into Tropical Australia.] By **W. J. Hooker.**

Sur la Famille des Linées: par **J. E. Planchon** (continued), Lond. Journ. Bot., vii., 165–186, 473–501, 507–528.

Botanical Magazine, vol. lxxiv.

Icones Plantarum, vol. viii.

Guide to the Gardens, eds. III. and IV.

Report [Civil Services, Estimates, 1847].

London Journal of Botany, vol. vii.

1849.

The Rhododendrons of Sikkim Himalaya. By **J. D. Hooker.**

On the probable extent of the Flora of the Coal Formation in Britain. By the same, Am. Journ. Sc., Ser. II., viii., 131–133.
(Extracted from Veget. Carboniferous Period, 1848–49.)

Notes, chiefly botanical, made during an Excursion from Darjiling to Tonglo. By the same, Journ. As. Soc. Beng., xviii., 419–446.

Niger Flora; or an enumeration of the Plants of western tropical Africa. Collected by Theodore Vogel, botanist to the Voyage of the Expedition sent by H. B. M. to the River Niger in 1841, under the command of Captain H. D. Trotter, including Spicilegia Gorgonea by Ph. B. Webb, and Flora Nigritiana by J. D. Hooker and G. Bentham, with a sketch of the Life of Dr. Vogel. By **W. J. Hooker.**

Botany. By **W. J. Hooker.** (Forms Section XII., pp. 400–422, of A Manual of Scientific Enquiry, ed. by J. F. W. Herschel.)

Jute, Fibre of *Corchorus capsularis;* Chinese Grass Cloth; Pooah, or Puya fibre of Nepal and Sikkim; Oadal, or fibre of *Sterculia villosa;* fibre of *Sterculia guttata*, Roxb.; *Musa textilis*, Fibre of the Manilla Hemp. [By **W. J. Hooker**], Kew Journ., i. 25–28.
Jute, repr. in Pharm. Journ., ix. (1850), 545, l.c., 121–123.

Piacaba; fibre and fruit of the Coquilla Nut, *Attalea funifera*, Mart. By the same.
Repr. On Piacaba and Coquilla Nuts, Pharm. Journ., ix. (1850), 431–432.

Some account of the Vegetable Ivory Palm (*Phytelephas macrocarpa*), by the same, l.c., 204–212.
Repr. in Pharm. Journ., ix. (1850), 369–375.

Putch-Pat, or Patchouli (*Pogostemon Patchouli*). By the same, l.c. 328–330.
Abstract in Pharm. Journ., ix. (1850), 282.

Description of a new Melastomaceous Plant, discovered in Jamaica, by Dr. MacFadyen. [By the same,] l.c., 379.

Botanical Magazine, vol. lxxv.

Guide to the Gardens, ed. V.

Return of the Number of Visitors . . . . (Parl. Papers).

Journal of Botany and Kew Garden Miscellany, vol. i.

1850.

[Specimens communicated to the Museum at Kew by R. Spruce. By **W. J. Hooker**], Kew Journ., ii. 70–76.

Jute; *Corchorus capsularis*, L. By the same, l.c., 91–92.

African Oak (or Teak) [*Oldfieldia africana*]. [By the same], l.c., 183–186.

Eboe Nut of the Mosquito shore. [By the same], l.c., 249–250.

Chinese "Rice paper" or "Bok-Shung." [By the same], l.c., 27–29, 250–253.
Abstract in Pharm. Journ, ix., 545–546.

Description and Figure of the Cedron of the Magdalena river (*Simaba Cedron*, Planch.). By the same, l.c., 377–382. (*See* an additional note in the next volume, p. 59–60.)
Repr. in Pharm. Journ., x., 344–348; 472.

Botanical Magazine, vol. lxxvi.

Guide to the Gardens, ed. VIII.

Return of the Number of Visitors . . . [Parl. Papers, 1849].

Journal of Botany and Kew Garden Miscellany, vol. ii.

1851.

Great Exhibition of 1851. Report;—Jury, Class III., pp. 123–162. Report on Substances used as Food. By **J. D. Hooker**.

Victoria regia; or, Illustrations of the Royal Water Lily, in a series of figures chiefly made from specimens flowering at Syon and at Kew. By W. Fitch; with descriptions by **W. J. Hooker**.
An elephant folio containing four beautifully coloured plates by Fitch.

Botany. By **W. J. Hooker**. (In the Admiralty Manual of Scientific Inquiry, ed. II., p. 416–437.)

Figure and Description of a new Species of *Ranunculus* [*R. digitatus*], from the Rocky Mountains. By the same, Kew Journ., iii., 124–125.

Catalogue of Mr. Geyer's Collection of Plants gathered in the Upper Missouri, the Oregon Territory, and the intervening portion of the Rocky Mountains [continued]. By the same, l.c., 287–300.

Figures and Descriptions of two Species of *Boehmeria*, of which the fibre is extensively used in making Cloth. By the same, l.c., 312–317.

Repr. Pharm. Journ., xi., 276–278.

Botanical Magazine, vol. lxxvii.

Guide to the Gardens, ed. X.

Report . . . for . . . 1850.

Return of Number of Visitors [Parl. Papers, 1850].

Journal of Botany and Kew Garden Miscellany, vol. iii.

1852.

The Botany of the Antarctic Voyage of H.M.S. "Erebus" and "Terror." By **J. D. Hooker.** II. Flora Novæ-Zelandiæ, Parts 1 and 2, pp. 1–80.

On the Climate and Vegetation of the temperate and cold regions of East Nepal and the Sikkim Himalaya Mountains. By the same, Journ. Hort. Soc., vii., 69–131.

Description of a new Species of *Amomum* [*A. Danielli*] from Tropical West Africa. By the same, Kew Journ., iv. (1852), 129–130.
Reprinted as *Amomum Granum-paradisi*; Grains of paradise Amomum, or Mellegetta Pepper, in Pharm. Journ., xii., 192–194.

Description du *Barclaya longifolia*, Wall., de la famille des Nymphéacées. By **W. J. Hooker.** Ann. Sc. Nat., sér. III., xvii., 301–304.

On the Chinese Rice Paper. By the same, Kew Journ., iv., 50–54.

Notice of a new species of *Deparia*, discovered by Charles Moore, in New Caledonia. [By the same], l.c., 54–56.

Notice of a new species of *Dammara*, detected by Mr. Charles Moore in La Peyrouse's Island. By the same, l.c., 115–116.

Kew Gardens Museum. Tallow-tree, and Insect Wax of China; Pe-la, or Insect-wax. [By the same], l.c., 150–154.

On the Camphor-tree of Borneo and Sumatra, *Dryobalanops Camphora*, Coleb. By the same, l.c., 200–206; 285.
Repr. Pharm. Journ., xii., 300–302.

Paper of Daphne Laurel (Spurge Laurel). [By the same], l.c. 312–313.

Gynerium saccharoides. [By the same], l.c., 313–314.

Cosciniscium [i.e., *Coscinium*] *fenestratum*, (False Calumba-root). By the same, Pharm. Journ., xii., 185–188.

The Botany of the Voyage of H.M.S. "Herald," under the command of Captain Henry Kellett, during the years 1845-51. By **B. Seemann.**

Part 1. The publication was completed in 1857.

Botanical Magazine, vol. lxxviii.

Icones Plantarum, vol. ix.

Guide to the Gardens, ed. XI.

Report, . , for . . 1851.

Journal of Botany and Kew Garden Miscellany, vol. iv.

1853.

The Botany of the Antarctic voyage of H.M.S. "Erebus" and "Terror." By **J. D. Hooker.** II. Flora Novæ Zelandiæ. Parts 3 and 4, pp. 81–160.

On a new Genus [*Milligania*], and some new Species of Tasmanian plants. By the same, Kew Journ., v. 296–300.

Botanical Expedition to Oregon. [By the same], l.c., 315–317; 395.

On the Distribution and organic contents of the "Ludlow Bone Bed" in the districts of Woolhope and May Hill. With a note on the seed-like bodies found on it. By **J. D. Hooker,** and **H. E. Strickland,** Geol. Soc. Journ., ix., 8–12.

The Rice-Paper Plant. [By **W. J. Hooker**], Kew Journ., v., 79–84.

Rhododendrons of Sikkim-Himalaya. [By the same], l.c., 152–154.

Botanical objects communicated to the Kew Museum from the Amazon River in 1851, by Richard Spruce, Esq. [By the same], l.c., 169–177; 238–247.

Notice of two new Ferns from China. By the same, l.c., 236–238.

Catalogue of Mr. Geyer's Collection . . . (continued). By the same, l.c., 257–265.

Description and Figure of a new Fern from Malacca [*Polypodium lobbianum*]. By the same, l.c., 309–311.

Kew Gardens Museum; or, a Notice of the Origin, and some of the contents of the Museum of Economic Botany attached to the Royal Gardens, Kew. By the same, l.c., 329–337; 381–389.

On a new Species of *Horkelia*, from the Upper Platte River. By the same, l.c., 341–342.

Description of a new Species of *Eriogonum*, discovered in California by Mr. Jeffrey. By the same, l.c., 365–366.

Notes on Flowering Plants and Algæ, collected during the voyage of the "Isabel." By Sir **W. J. Hooker** and **G. Dickie.**

Forms pp. 133–144 of "A Summer Search for Sir John Franklin, . . by Comm. E. A. Inglefield, &c. (Reprinted in "Manual . . . for use of Arctic Expedition of 1875," p. 239.)

Catalogue of hardy Herbaceous Plants in the Royal Gardens of Kew. By **J. C. Niven.**

An enumeration of upwards of 6,000 species, prepared by the Foreman of the Herbaceous Department for the purpose of exchange with other establishments. (W. B. H.)

Botanical Magazine, vol. lxxix.

Report . . for . . 1852.

Journal of Botany and Kew Garden Miscellany, vol. v.

1854.

The Botany of the Antarctic Voyage of H.M. ships "Erebus" and "Terror." By **J. D. Hooker.** II. Flora Novæ-Zelandiæ. Parts 5 and 6, pp. 161–240.

Himalayan Journals; or, Notes of a Naturalist in Bengal, the Sikkim and Nepal Himalayas, the Khasia Mountains, &c. With maps and illustrations. By the same. 2 vols.

Notes on the Fossil Plants from Reading. By the same, Geol. Soc. Journ., x., 163–166.

On a new species of *Volkmannia* (*V. Morrisii*). By the same, l.c., 199–202.

On some species of *Amomum*, collected in Western Tropical Africa, by Dr. Daniel. By the same, Kew Journ., vi., 289–297.

On the Functions and Structure of the Rostellum of *Listera ovata.* By the same, Phil. Trans., cxliv., 259–264.
Transl. Les fonctions et la structure du Rostellum dans le *Listera ovata*, Ann. Sc. Nat. sér IV., iii., 85–90.

On the Structure and Affinities of *Trigonocarpon* (a Fossil Fruit of the Coal-Measures). By the same, Proc. Roy. Soc., vii., 28–31; Ann. & Mag. Nat. Hist., ser. II., xiv., 209–212.

On *Maddenia* and *Diplarche*, new Genera of Himalayan Plants. By **J. D. Hooker** and **T. Thomson**, Kew Journ., vi., 380–384.

A Century of Ferns; being figures with brief Descriptions of one Hundred new or rare, or imperfectly known Species of Ferns, from various parts of the World. A selection from the Author's "Icones Plantarum." By **W. J. Hooker.**

A separate issue of the tenth volume of Hooker's Icones Plantarum. The "Second Century of Ferns" (1860), was a distinct publication.

Kew Garden Museum, &c. (continued). By the same, Kew Journ., vi., 10–26.

Jumping, or Moving Seeds. [By the same], l.c., 304–306.

Pine-leaf Fibre of Silesia and the Bahamas. [By the same], l.c., 90–93.

On the "Argan" Tree of Marocco (*Argania Sideroxylon*) By the same, l.c., 97–107.

Botanical Magazine, vol. lxxx.

Icones Plantarum, vol. x.

Report . . . . 1853.

Journal of Botany and Kew Garden Miscellany, vol. vi.

1855.

On the South American Triurideæ and leafless Burmanniaceæ from the collections of Mr. Spruce. By **G. Bentham,** Kew Journ., vii., 8–17.

Florula Hongkongensis, an enumeration of the Plants collected in the Island of Hongkong. By Major J. G. Champion, . . . the determinations revised, and the new species described by **G. B.**—Monocotyledons, l.c., 33–39.

Additional note on *Arachis hypogæa.* By the same, l.c., 177–179 (cf., viii. (1856) 380).

Notes on the Roogee of Kumaon, *Megacarpæa polyandra.* By the same, l.c., 353–357.

The Botany of the Antarctic Voyage of H.M.S. "Erebus" and "Terror." . . . By **J. D. Hooker.** II. Flora Novæ-Zelandiæ. Parts 7 & 8 (and last), pp. 241–312. III. Flora Tasmaniæ; Part 1.

Illustrations of Himalayan plants, chiefly selected from drawings made for the late J. F. Cathcart, Esq., of the Bengal Civil Service. By the same.

On some minute seed-vessels [*Carpolithes Ovulum,* Brongn.] from the Eocene beds of Lewisham. By the same, Geol. Soc. Journ., xi., 562–565.

On some small seed-vessels [*Folliculites minutulus,* Bronn] from the Bovey Tracey Coal. By the same, l.c., 566–570.

On *Chortodes,* a subgenus of *Flagellaria,* from the Isle of Pines (New Caledonia). By the same, Kew Journ., vii., 198–200.

On the structure of certain Limestone nodules enclosed in seams of Bituminous coal, with a description of some Trigonocarpons contained in them. By **J. D. Hooker** and **E. W. Binney,** Phil. Trans., cxlv., 149–156.

Flora Indica; being a systematic account of the plants of British India, &c. By **J. D. Hooker** and **T. Thomson,** vol. i.

On *Enkyanthus himalaicus* and *Cassiope selaginoides,* two new species of Himalayan Ericeæ. By the same, Kew Journ., vii., 124–126.

On two Fibres from Brazil: by T. C. Archer; with a Note by **W. J. Hooker.** Kew Journ, vii., 84–87.

The note constitutes four-fifths of the article.

Kew Gardens Museum, &c. (continued). By the same. Kew Journ., vii., 97–114; 129–138.

Botanical Objects . . . Kew Museum . . in 1853, &c. By the same, l.c., vii., 209–210; 245–252; 273–278.

Asplenium fontanum, Br., a British plant. By the same, l.c., 340–343.

Catalogue of Mr. Geyer's Collections (continued). By the same, l.c., 371–378.

Botanical Magazine, vol. lxxxi.

Guide to the Gardens, ed., XIII.

Report, . . . 1854.

Journal of Botany and Kew Garden Miscellany, vol. vii.

Museum of Economic Botany: a Guide to the Museum, &c.

1856.

Description of two American Species of *Gnetum*. By **G. Bentham.** Kew Journ., viii., 357–359.

Notes on Loganiaceæ. By the same, Journ. Linn. Soc., i., 52–114.

The Botany of the Antarctic Voyage of H.M.S. "Erebus" and "Terror." By **J. D. Hooker.** III., Flora Tasmaniæ, parts 2 and 3.

On some Collections of Arctic Plants chiefly made by Dr. Lyall, Dr. Anderson, Herr Miertsching, and Mr. Rae, during the Expeditions in search of Sir John Franklin, under Sir John Richardson, Sir Edward Belcher, and Sir Robert M'Clure. By **J. D. Hooker**, Journ. Linn. Soc., i., 114–124.

On the Botany of Raoul Island, one of the Kermadec group in the South Pacific Ocean. By the same, l.c., 125–129.
Based on a collection of plants made by Mr. MacGillivray, Naturalist to H.M.S. "Herald."

On the structure and affinities of Balanophoreæ. By the same, Trans. Linn. Soc., xxii. (1856), 1–68.

Catalogue of Mr. Geyer's plants (continued), by **W. J. Hooker**, Kew Journ., viii., 16–19.

Use of *Scirpus lacustris* (Bullrush) in South America. By the same, l.c., 20–21.

Agave americana in Devonshire. By the same, l.c., 26–27.

Balsam-bog (*Bolax glebaria*, Comm.). By the same, l.c., 74–80.

The Mammoth Tree (*Sequoia gigantea*). [By the same], l.c., 150–151.

Ensete of Bruce. [By the same], l.c., 210–214.

The Soap-Plant of California. [By the same], l.c., 317–319.

Cuba Bast in Jamaica. [By the same], l.c., 347–350.

Jersey Cabbages. [By the same], l.c., 350–351.

Odal oil. [By the same], l.c., 378.

On *Polypodium anomalum*; a new Species of Fern, bearing its Sori on the upper side of the Frond. By the same, l.c., 360–362.

Catalogue of the Ferns in the Royal Gardens of Kew, prepared by **J. Smith**, Curator, for the purpose of exchange with other gardens.

Botanical Magazine, vol. lxxxii.

Guide to the Gardens, ed. XIV.

Report . . for . 1855.

Journal of Botany and Kew Garden Miscellany, vol. viii.

Catalogue of certain succulent Plants (viz., Cactaceæ, the genera *Mesembryanthemum* and *Aloë*) in the Royal Gardens of Kew. For the purpose of exchange with other gardens.

1857.

On Professor Nees von Esenbeck's Genera of Acanthaceæ, in the eleventh volume of De Candolle's Prodromus. By **G. Bentham**, Kew Journ., ix., 75–78.

Memorandum on the Principles of Generic Nomenclature in Botany. By the same, Journ. Linn. Soc., ii., 30–33.

On *Brachynema* and *Phoxanthus*, two new Genera of Brazilian plants. By the same, Trans. Linn. Soc., xxii., 125–128.

The Botany of the Antarctic Voyage of H.M.S. "Erebus," and "Terror." By **J. D. Hooker**. III., Flora Tasmaniæ, parts 4 and 5.

Descriptions of two new Dilleniaceous Plants from New Caledonia and Tropical Australia. By the same, Kew Journ. ix., 47–49.

On *Notospartium*, a new genus of Leguminosæ, from New Zealand. By the same, l.c., 176–177.

On *Loxodiscus*, a new genus of Sapindaceæ from New Caledonia. By the same, l.c., 200–201.

On a new species of *Diapensia*, from the Eastern Himalaya. By the same, l.c., 372–373.

On the Growth and Composition of the Ovarium of *Siphonodon celastrineus*, Griffith, especially with reference to the subject of its Placentation. By the same, Trans. Linn. Soc., xxii., 133–139.

On *Bryocarpum*, a new genus of Himalayan Primulaceæ. By **J. D. Hooker** and **T. Thomson**, Kew Journ., ix., 199–200.

On three new Indian Scrophularineæ. By the same, l.c., 243–246.

Præcursores ad Floram Indicam; being Sketches of the Natural Families of Indian Plants, with Remarks on their Distribution, Structure, and Affinities.—Stylidieæ, Goodenoviæ, Campanulaceæ. By the same, Journ. Linn. Soc. ii., 1–29.

—— Saxifrageæ, Crassulaceæ, Droseraceæ, Parnassieæ, Grossularieæ, Hamamelideæ, and Philadelphiæ. l.c., 54–103.

Paris Universal Exhibition. Report on Vegetable Products obtained without cultivation. By **W. J. Hooker**.

Scientific Exploring Expeditions of the British Government. [By **W. J. Hooker**], Kew Journ., ix. (1857), 121–123.

On the Palmite of South Africa. By the same, l.c., 173–175.

On *Asplenium* (§ *Schaffneria*) *nigripes*, a Mexican, and on *Davallia nodosa*, an Indian Fern. By the same, l.c., 268–272.

Mr. Wilford's Botanical Mission to the Chinese Seas. By the same, l.c., 273–274.

Flora of the British West Indian Islands; by Dr. Grisebach [notice of the work, and letters from Sir **W. J. Hooker** and others], l.c., 274–279.

Florula Hongkongensis: . . The Filices. By **W. J. Hooker**, l.c., 333–344; 353–363.

Note of the editor [**W. J. Hooker**], l.c., 383–384. (A short history of the various journals edited by him.)

British North-American Exploring Expedition [with Instructions to the Collector]. By **W. J. Hooker** and **J. D. Hooker**. Kew Journ., ix., 213–219, 311.

The Botany of the Voyage of H.M.S. "Herald." By **B. Seemann**. Last part; the first part was issued in 1852.

Cultivated Ferns; or, a Catalogue of Exotic and Indigenous Ferns cultivated in British Gardens, with Characters of the Genera, Principal Synonyms, etc. By **J. Smith**.

Botanical Magazine, vol. lxxxiii.

Guide to the Gardens, ed. XV.

Report, . . . for . . . 1856.

Journal of Botany and Kew Garden Miscellany, vol. ix.

1858.

Handbook of the British Flora: a description of the flowering plants and ferns indigenous to, or naturalized in, the British Isles. By **G. Bentham**.

Synopsis of Legnotideæ, a tribe of Rhizophoraceæ. By the same, Journ. Linn. Soc., iii., 65–80.

Synopsis of the Compound Sphæriæ of the Hookerian Herbarium. By **F. Currey**, Trans. Linn Soc., xxii., 257–287.

The Botany of the Antarctic voyage of H.M.S. "Erebus" and "Terror." . . . By **J. D. Hooker**. III., Flora Tasmaniæ, parts 6 & 7.

Præcusores ad Floram Indicam . . . Caprifoliaceæ. By **J. D. Hooker** and **T. Thomson**, Journ. Linn. Soc., ii., 163–180.

Enumeratio Plantarum Zeylaniæ: an Enumeration of Ceylon plants, with Descriptions of the new and little known Genera and Species, observations on their habitats, uses, and native names. By **G. H.**

K. Thwaites. Assisted in the identification of the species and synonymy, by **J. D. Hooker**. Part i., 1–80.

With the exception of Moon's very incomplete catalogue of 1824, no work professing to be a complete enumeration of the plants since the appearance of Linnæus's "Flora Zeylanica," in 1747. It includes 2832 flowering plants and vascular cryptogams, and is supplemented by Dr. Trimen's catalogue of 1885.

This was issued in five parts, and completed in 1864. (W. B. H.)

Botanical Magazine, vol. lxxxiv.

Guide to the Gardens, ed. XVI.

Report, . . . for . . . 1857.

1859.

Martius, Flora Brasiliensis. Leguminosæ. I. Papilionaceæ, xv., pars I. (pp. 1–216). Auctore **G. Bentham**.

On the genus *Henriquezia* of Spruce. By the same, Trans. Linn. Soc., xxii., 295–298.

Synopsis of the Fructification of the Simple Sphæriæ of the Hookerian Herbarium. By **F. Currey**, Trans. Linn. Soc., xxii. 313–335.

The Botany of the Antarctic Voyage of H.M.S. "Erebus" and "Terror." By **J. D. Hooker**. III. Flora Tasmaniæ, parts 8–11 (and last).

On the Origin and Development of the Pitchers of *Nepenthes*, with an Account of some new Bornean Plants of that Genus. By the same, Trans. Linn. Soc., xxii., 415–424.

On a new Genus of Balanophoreæ [*Dactylanthus*], from New Zealand, and Two new Species of *Balanophora*. By the same, l.c., 425–427.

Præcursores ad Floram Indicam.—Balsamineæ. By **J. D. Hooker** and **T. Thomson**, Journ. Linn. Soc., iv., 106–157.

Botany. By **W. J. Hooker, assisted** by **D. Hanbury**; in Admiralty Manual of Scientific Enquiry, ed. III., by R. Main. Art. XV., pp. 413–439.

Filices Exoticæ; or, Figures and Descriptions of Exotic Ferns; chiefly of such as are cultivated in the Royal Gardens of Kew. 100 coloured plates by W. Fitch. By **W. J. Hooker**.

Musci Indiæ Orientalis; an Enumeration of the Mosses of the East Indies. By **W. Mitten**, Journ. Linn. Soc., iii., Suppl. i., 1–158.

The Indian Species of *Utricularia*. By **D. Oliver**, Journ. Linn. Soc., iii., 170–190.

Observations on the Structure of the Stem in certain Species of the Natural Orders Caryophylleæ and Plumbagineæ. By the same, Trans. Linn. Soc., xxii., 289–294.

Enumeratio Plantarum Zeylaniæ. By **G. H. K. Thwaites**. Part 2, pp. 81–160.

Botanical Magazine, vol. lxxxv.

Report, . . . for . . . 1858.

Report, ... from 1853 to 1859.

1860.

Florula Adenensis. A systematic account with descriptions of the Flowering Plants hitherto found at Aden. By **T. Anderson**, Journ. Linn. Soc., v., Suppl. i.

Flora Tasmaniæ. By **J. D. Hooker**. (Date on title page; issued in parts, 1855–59.)

The monstrous *Begonia frigida* at Kew in relation to Mr. Darwin's "Theory of Natural Selection." By the same, Ann. and Mag. Nat. Hist., Ser. III., v., 350–352.

On the Origination and Distribution of Species. Introductory Essay to the Flora of Tasmania. By the same. Reprinted in Am. Journ. Sc., Ser. II., xxix., 1–25, 305–326.

On the species of *Cordyline* now in cultivation from New Zealand and Australia. By the same, Gard. Chron. (1860), 791–792.

Illustrations of the Floras of the Malayan Archipelago and of Tropical Africa. By the same, Trans. Linn. Soc., xxiii., 155–172.

A second Century of Ferns. By **W. J. Hooker**.
An octavo volume; the drawings by W. Fitch. The first "Century of Ferns" formed the tenth volume of Hooker's "Icones Plantarum."

On some new species of Musci and Hepaticæ in the Herbarium of Sir W. J. Hooker, collected in Tropical Africa, &c. By **W. Mitten**, Trans. Linn. Soc., xxiii., 51–58.

On *Sycopsis* [a new genus of Hamamelideæ]. By **D. Oliver**, Trans. Linn. Soc., xxiii., 83–89.

Enumeratio Plantarum Zeylaniæ. By **G. H. K. Thwaites**. Part 3, pp. 161–240.

Botanical Magazine, vol. lxxxvi.

Guide to the Gardens, ed. XIX.

Report . . for . . . [1859].

1861.

Flora Hongkongensis; a description of the flowering plants and ferns of the Island of Hongkong. By **G. Bentham**.

Outlines of Elementary Botany, as introductory to local Floras. By the same.

(Reprinted from the Introduction to the preceding work.)

On the Species and Genera of plants, considered with reference to their practical application to Systematic Botany. By the same, Nat. Hist. Review, 1861, 133–151.

Notes on Ternstrœmiaceæ. By the same, Journ. Linn. Soc., v., 53–65.

Notes on Anonaceæ. By the same, l.c., 67–72.

Botanical Memoranda. By the same, l.c., 72–78.

On *Fissicalyx*, a new Genus of Dalbergieæ. By the same, l.c., 78–79.

Notes on Menispermaceæ. By the same, l.c., Suppl. II., 45–52.

Notes on Tiliaceæ. By the same, l.c., 52–74.

Notes on Bixaceæ and Samydaceæ. By the same, l.c., 75–94.

On *Fissicalyx* and *Prioria*, two recently established Genera of Leguminosæ. By the same, Trans. Linn. Soc., xxiii., 389–391.

Catalogue of Japan Plants. By **A. A. Black.**

The able but prematurely deceased curator of the Herbarium published little, though he left a good record in the Herbarium itself. This list, comprising 1,600 species of flowering plants and ferns, appeared in Hodgson's "Japan." Since that date the number of known Japanese plants has about doubled. (W. B. H.)

On *Fropiera*, a new Mauritian Genus of Calycifloral Exogens, of doubtful affinity. By **J. D. Hooker.** Journ. Linn. Soc., v. 1–2.

On *Barteria*, a new Genus of Passifloreæ from the Niger River. By the same, l.c., 14–15.

An Account of the Plants collected by Dr. Walker in Greenland and Arctic America, during the expedition of Sir Francis M'Clintock, R.N., in the yacht "Fox." By the same, l.c., 79–89.

Outlines of the Distribution of Arctic Plants. By the same, Trans. Linn. Soc., xxiii. (1861), 251–348.

On Three Oaks of Palestine. By the same, l.c., 381–387.

Notice sur les espèces de *Cordyline* de la Nouvelle Zélande et de l'Australie. Par [le même]. Traduit . . . par G. Barlet. Belg. Hortic., xi., 66–70.
(For the original, *see* under 1860.)

Præcursores ad Floram Indicam.–Cruciferæ. By **J. D. Hooker** and **T. Thomson,** Journ. Linn. Soc., v. 128–181.

The British Ferns; or, coloured Figures and Descriptions, with the needful Analyses of the Fructifications and Venation, of the Ferns of Great Britain and Ireland, systematically arranged. By **W. J. Hooker.** The drawings by W. Fitch.

Commercial products of the Asphodel. By the same, [from The Technologist.] Pharm. Journ., ser. II., iii., 24.

Hepaticæ Indiæ Orientalis: an Enumeration of the Hepaticæ of the East Indies. By **W. Mitten,** Journ. Linn. Soc., v., 89–128.

Notes on Aurantiaceæ. By **D. Oliver,** Journ. Linn. Soc., v., Suppl. II., 1–44.

Enumeratio Plantarum Zeylaniæ. By **G. H. K. Thwaites.** Part 4, pp. 241–320.

Botanical Magazine, vol. lxxxviii.

Guide to the Museum. By **D. Oliver.**

Report . . for . . [1860].

1862.

Martius, Flora Brasiliensis. Leguminosæ. I. Papilionaceæ, xv., pars I. (p. 217–end). Auctore **G. Bentham.**

Notes on Caryophylleæ, Portulaceæ, and some allied Orders. By the same, Journ. Linn. Soc., vi., 55–77.

Notes on Malvaceæ and Sterculiaceæ. By the same, l.c., 97–123.

On *Inocarpus.* By the same, l.c., 146–150.

On African Anonaceæ. By the same, Trans. Linn. Soc., xxiii., 463–480.

[Address to the Linnean Society.] By the same, Proc. Linn. Soc., 1861–62, pp. lxvi.–lxxxiii.

Genera Plantarum ad Exemplaria imprimis in Herbariis Kewensibus servata definita, auctoribus **G. Bentham** et **J. D. Hooker.** Vol. i., pars I., came out in this year; the last part appearing in 1883.

Florula Mallica. By **M. P. Edgeworth,** Journ. Linn. Soc., vi., 179–210.

On the Vegetation of Clarence Peak, Fernando Po; with Descriptions of the Plants collected by Mr. Gustav Mann on the higher parts of that mountain. By **J. D. Hooker,** Journ. Linn. Soc., vi., 1–23.

On the Cedars of Lebanon, Taurus, Algeria, and India. By the same, Nat. Hist. Review, 1862, p. 11–18.

Garden Ferns. By **W. J. Hooker.** The drawings by W. Fitch.

The Atlantis Hypothesis in its Botanical Aspect. By **D. Oliver,** Nat. Hist. Review (1862), 149–170.

The Structure of the Stem in Dicotyledons. By the same, l.c., 298–329.

On the Distribution of Northern Plants. By the same, Proc. R. Inst., iii., 431–433; Geologist, v. (1863), 262–263.

Note on the Structure of the Anther. By the same, Trans. Linn. Soc., xxiii., 423–428.

Note on *Hamamelis* and *Loropetalum*; with a Description of a new *Anisophyllea* from Malacca. By the same, l.c., 457–461.

Viti: an Account of a Government Mission to the Vitian and Fijian Islands in the years 1860–61. By **B. Seemann.**

Botanical Magazine, vol. lxxxviii.

Guide to the Gardens, ed. XXI.

Guide to the Museums (re-issue).

Report. . . for . . 1861. (Also reprinted in folio.)

1863.

An Enumeration of the Species of Acanthaceæ from the Continent of Africa and the adjacent islands. By **T. Anderson**, Journ. Linn. Soc., vii., 13–54.

[Address to the Linnean Society.] By **G. Bentham**, Proc. Linn. Soc., 1862–63, pp. xi.–xxix.

Flora Australiensis: a Description of the Plants of the Australian Territory. Vol. i. By **G. Bentham**, assisted by **F. Mueller.**

The first volume was issued in this year, and the seventh and last in 1878.

On the Nardoo Plant of Australia. By **F. Currey**, Journ. Bot., i., 161–167.

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Bulletin of Miscellaneous Information. Nos. 97–108. App. I.–III.

The Journal of the Kew Guild. [iii.]

DXLII.—MISCELLANEOUS NOTES.

Mr. William Thorpe, a member of the gardening staff at Kew, has been appointed a propagator at the Botanic Gardens at Durban, in the Colony of Natal. He left for South Africa on December 5, 1896.

Visitors during 1896.—The number of persons who visited the Royal Gardens during the year 1896 was 1,396,875. That for 1895 was 1,407,369. The average for 1886–95 was 1,425,526. The total number on Sundays was 536,181, and on weekdays 855,715. The maximum number of visitors on any one day was 86,399 on May 25, and the smallest 62 on March 18.

The detailed monthly returns are given below :—

January	20,378
February	27,782
March	33,648
April	199,327
May	300,353
June	203,305
July	202,261
August	264,543
September	73,397
October	33,670
November	23,074
December	15,137
Total	1,396,875

Botanical Magazine for December.—The number for this month concludes the 122nd volume of the work, which is dedicated to Mr. Gustav Mann, late Assistant Conservator of Forests, Assam. The plants figured are: *Grammatophyllum rumphianum*, *Prunus subhirtella*, *Coriaria japonica*, *Cypripedium Exul*, and *Iris albopurpurea*. The *Grammatophyllum* is a robust orchid from the Moluccas and Borneo. Two plants were received at Kew, one from Mr. C. Ford, F.L.S., Superintendent of the Botanic Gardens, Hongkong, and the

other from Messrs. F. Sander & Co., of St. Albans, both flowering in June 1895 The pretty Japanese *Prunus* was received from Professor Sargent, Director of the Arnold Arboretum, Boston, in 1895, and flowered at Kew in April of the present year. The flowers appear before the leaves. The *Coriaria*, also Japanese, flowered in Canon Ellacombe's garden at Bitton last June. Its coral red flowers render it very conspicuous. Seeds sent to Kew by Professor Sargent produced plants one of which flowered simultaneously with that in Canon Ellacombe's garden. *Cypripedium Exul*, native of Siam, closely resembles *C. insigne.* The figure was prepared from a plant which was sent to Kew in 1892 by Messrs. F. Sander & Co. The *Iris* is a new species, imported from Japan. It flowered at Kew in June.

Journal of Sir Joseph Banks.—In the Historical Account of Kew (*K. B.*, 1891, pp. 305–9) some account is given of Banks's connexion with it, and of the encouragement he gave to botanical work. It is remarked: "No scientific man of his eminence probably ever did so little personally, or was the inspiring cause of so much being done by others." This is only true in the sense of work actually accomplished. Banks's energy in the interests of science was unbounded. But the undoubted fact remains that hitherto there has been little or nothing to show for it. He has not even received credit for the remarkable Journal, now published after the lapse of more than a century, of Captain Cook's first voyage round the world. It was largely, it is true, embodied in Hawkesworth's narrative. But there is nothing to show who was responsible for any particular description or statement.

Three years ago Cook's own Journal was published by Admiral Wharton. That of Banks is at length, after the singular series of accidents described by the editor, given to the world. It cannot be doubted that it places Banks's scientific reputation in an entirely new position. In ardour, judgment, energy, keenness of observation, and indefatigable scientific interest we see that he takes his place in the very front rank of scientific explorers. But the fact remains that his labours yielded no tangible result at his own hands, and till the present publication of his Journal, the world may be said to have remained ignorant of their extent. The vast series of figures on copper-plates of the plants collected which Banks had prepared at his own cost remains unutilized at the British Museum. It might have been thought that the trustees who inherited his collections and magnificent library would at least have made these available to science if only as a memorial to their author.

Nothing could be more appropriate than that the task of editing the Journal should have fallen into the hands of Sir Joseph Hooker. He followed Banks in the investigation of the flora of the extreme south of America and of New Zealand, and was actually the first to publish many of the plants first collected by him and his botanist, Dr. Solander, both in his Flora Antarctica and his Flora Novæ Zealandiæ. And he also ultimately followed him in the scientific direction of Kew.

Nothing is more remarkable about the book, disinterred as it is from a long oblivion, than its freshness. It depicts the countries of the southern hemisphere as they first revealed themselves to northern navigators and records with vivid accuracy conditions of savage life which are for the most part passed away for ever.

Australian Myrmecophilous Plants.—In Banks's *Journal* (p. 304) of Captain Cook's first voyage, lately edited by Sir Joseph Hooker, he describes an epiphytic plant having a large tuberous rhizome permeated by innumerable winding passages invariably inhabited by ants. The species observed by Banks was inhabited by red ants, even in a young state, when the tuber was little larger than a hazel nut. The plant was very abundant, and the tuber of the older ones was often " much larger than a large turnip." Banks identified it with the *Nidus Formicarum ruber* of Rumphius (*Herbarium Amboinense*, vi. p. 120. t. 55. f. 2), subsequently named *Myrmecodia Rumphii* by Beccari (*Malesia*, ii. p. 117), which, however, is only known with certainty to inhabit Amboyna. No species of this singular group of plants is included in Bentham's *Flora Australiensis* (1866); but in 1867, Dr. Ch. Moore, Director of the Sydney Botanic Gardens, sent some living plants, which had been brought from Cape York by Captain Nares, to Kew. In a communication relating to these plants (*Journal of Botany* vi. (1868), p. 52), Mr. G. Bennett quotes a letter from Dr. [now Sir Joseph] Hooker, in which they are mentioned as *Myrmecodia armata* and *Hydnophytum formicarum*. These names were taken up by F. Mueller (*Fragmenta Phytographiæ Australis* vii. p. 45), and the latter is repeated in the first edition of his *Census of Australian Plants*, p. 75; whilst the former is given as *M. echinata*, which, in the second edition of the *Census*, is again altered to *M. Antoinii*. Kew was unsuccessful in cultivating the plants in question, and unfortunately the dead plants were not preserved, either as museum or herbarium specimens, so that we cannot be certain what they were, though the evidence is against the original determinations. This is not surprising because at that date only about half a dozen of the fifty species now known had been described.

The first successful importation of living plants of *Myrmecodia* seems to have been made by Messrs. J. Veitch, who presented a plant of *M. Beccarii*, Hook. f. (*Botanical Magazine*, t. 6883) to Kew in 1886. In the same year Mr. H. O. Forbes sent *Hydnophytum Forbesii*, Hook. f. (*Botanical Magizine*, t. 7218) from New Guinea to Kew, where it has been successfully cultivated. In 1891 a plant of *Hydnophytum longiflorum*, A. Gr., a native of Fiji, was sent to Kew by Mr. D. Yeoward, Curator of the Botanical Station there. This flowered in 1894, and was figured in the *Botanical Magazine*, t. 7343. In 1893, Professor C. Stewart, F.R.S., presented Kew with some plants of *Myrmecodia Antoinii*, Becc., which flowered last year, and a figure of it will appear in the *Botanical Magazine* for February, t. 7517. This was obtained from Thursday Island, off Cape York, North Australia. A third Australian species is represented in the Museum by a specimen from Somerset, North Australia, collected by the Macleay Expedition. It is apparently *Hydnophytum crassifolium*, Becc., a species found in the Aru Islands and in German New Guinea, two very distant localities. According to Sir Joseph Hooker (*Botanical Magazine*, 1894, sub. t. 7343), Dr. A. R. Wallace was the first to attempt the introduction of these plants, having sent a *Myrmecodia* to Kew about the year 1860. There are also plants in the Museum of the three Australian species named above, sent by the late Walter Hill, Director of the Brisbane Botanic Garden, which arrived in a dead condition.

[W. B. H.]

Rhizopus necans, Massee.

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ROYAL GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

Nos. 122–123.] FEBRUARY and MARCH. [1897.

DXLIII.—A LILY BULB DISEASE.

(*Rhizopus necans*, Mass.)

With Plate.

During the past year a destructive wave of fungoid disease almost completely ruined the crop of lily bulbs raised in Japan for exportation to Europe. The first indication of this disease received at Kew, was through Messrs. Tozer, Bros. and Co., of Gracechurch Street, who sent a large number of diseased bulbs for examination. These bulbs formed part of a consignment received from Japan in November last, consisting of 848 cases, containing 73,050 bulbs of *Lilium speciosum*, Thunb., "album" and "rubrum." Out of this number only 250 bulbs arrived in a saleable condition, the whole of the remainder being more or less rotten and worthless. At a later date the same firm received a second consignment of 37,590 very large bulbs of *Lilium auratum*, and out of this quantity only 4,000 were saleable. Similarly diseased bulbs, received from Japan, were afterwards sent to Kew for examination from other sources. Finally, a quantity of bulbs obtained through an agent from Japan, for planting at Kew, contained a large percentage suffering from the same type of disease.

The bulbs received for investigation showed every stage of disease; in the earliest condition, the base of the bulb is alone discoloured and somewhat soft; this discolouration and softening of the tissues gradually spreads from the base, until finally, in the most advanced stage, every part of the bulb is of a brownish colour, and sufficiently soft to admit of being readily crushed into a pulpy mass between the fingers.

Microscopic examination revealed the presence of slender, continuous, hyaline, branched hyphae traversing the tissues in every direction; the cell-walls are never pierced, but gradually dissolved, and it is only at the last stage of the disease that the starch grains become irregularly corroded, and gradually dissolved.

So long as the epidermis of the bulb-scales remains intact there is no trace of mycelium or fructification on the surface, but when the tissue is reduced to a soft pulp, or when a diseased bulb is cut open, the broken surface is within 24 hours covered with a dense snow-white mycelium, which within three days becomes studded with numerous clusters of fruit, resembling to the naked eye miniature pins with round black heads. The occurrence of this particular form of fungus on every bulb examined suggested that it might possibly be in some way associated

with the disease, and subsequent cultures and inoculations proved this surmise to be correct.

The fungus grows readily as a saprophyte; the spores germinating and forming the characteristic superficial white floccose mycelium, which within a week bears an abundance of fruit, on such varied culture media as prune juice, sterilised potato, decoction of bulb scales, &c. In one experiment four spores were sown in a 5 per cent. solution of cane-sugar in water in a Petri dish, and at the end of six days the entire surface of the liquid was covered with the fungus in a fruiting condition.

When spores were sown in a hanging-drop along with a very thin section of lily bulb-scale, it was observed that the germ-tubes could not enter the tissue through the epidermis, but that they entered readily at those points where the cells were not protected by the epidermis.

A set of experiments were also carried out, using healthy lily bulbs, some of which were furnished by Messrs. Tozer, for inoculation. For the purpose of destroying stray fungus spores the bulbs were immersed for a quarter of an hour in a 1 per cent. solution of corrosive sublimate. The bulbs were afterwards placed in wide-mouthed flasks filled with sterilised tap-water containing a 5 per cent. solution of cane-sugar, the base of the bulb being immersed in the liquid; finally, the entire bulb was covered with a sheet of cotton wool, soaked in a 1 per cent. solution of corrosive sublimate, the cotton wool being tied round the neck of the flask. When the roots were about an inch long an attempt at inoculation was made as follows:—The numerous cultures of the fungus furnished a large supply of spores, which were tested and found to germinate readily. These spores were collected with a wet camel-hair brush and washed off into a small amount of sterilised water in a flask until it became discoloured by the quantity of spores present; this was the inoculating material. A quantity of this spore-carrying water was added to the water in which two of the bulbs were growing, care being taken not to injure the roots; the inoculating liquid was also deposited freely between the scales of the two bulbs, which were then covered with sterilised cotton wool as before. The water in which two other bulbs were growing was inoculated as above, but the roots of the bulbs were broken off.

Finally, 1 per cent. of salicylic acid was added to the water in which two more bulbs were growing, a copious supply of the inoculating water added, the roots of the bulbs broken off, the bulbs replaced, and, as in the other instances, protected with cotton wool.

At the end of six weeks the two bulbs whose roots were not destroyed appeared to be quite healthy; they were then planted in soil, and are still growing and show no indication of disease. The two bulbs with broken roots showed signs of disease at the end of three weeks after inoculation, and at the six weeks period the disease had extended nearly half-way up the bulb from the base, as shown in fig. 1, which was drawn from this specimen. After being cut open the same kind of fungus showed itself on the surface that has been described as occurring on the bulbs received from Japan. The companion bulb was also diseased, and in about three months was soft and rotten, and covered with the fungus in a fruiting condition. The two bulbs with broken roots that were growing in water containing 1 per cent. of salicylic acid remained quite healthy, made fresh roots, and are still living.

Numerous experiments were made with other kinds of bulbs, and it was found that the fungus refused to grow on onions, however much mutilated. On the other hand, daffodil bulbs are very susceptible to the

disease; if the roots are broken, or a wound made in the bulb, and afterwards powdered with the spores, the disease showed itself within a a few days, and was in due course followed by the characteristic fruit of the fungus. It was invariably found that, however much bulbs were mutilated, and then inoculated with fungus spores, that submergence for a few minutes in a 1 per cent. solution of salicylic acid, or corrosive sublimate prevented the disease; in other words, all fungus spores coming in contact with the above-named solutions are destroyed, whereas the vitality of the bulbs thus treated is not at all affected.

Dr. Halstead has described* a somewhat similar disease, called "soft-rot," as attacking the sweet potato in the United States. The fungus causing this disease, *Rhizopus nigricans*, Ehrh., is closely allied to the species under consideration causing the lily bulb disease.

In addition to the kind of fungus fruit already described, a second form, of sexual origin, called a zygospore, is present in the genus *Rhizopus;* several large, spiny zygospores were found in the matted mycelium present on bulbs in the last stage of decay, and presumably belong to our fungus. Zygospores differ from the minute spores already described in requiring a somewhat lengthened period of rest before they germinate, by this means tiding the fungus over that period of the year not suitable for its growth, and germinating when favourable conditions, climatic and otherwise, return. During this period of rest, the zygospores remain in the soil, or attached to the substance on which they were produced. The minute spores previously described, possess the capacity of germination the moment they are mature, and enable the plant to extend its area of distribution; and as these spores are produced very quickly, and in immense numbers, it can readily be understood how rapidly the disease spreads when once introduced into a given locality.

The fungus causing the lily bulb disease, although allied to *Rhizopus nigricans*, is quite distinct from this and every other known species, and may be characterised as follows :—

Rhizopus necans (n. sp.).

Hyphis sterilibus continuis conglomeratis intricatis tenuibus candidis; hyphis sporangiferis erectis simplicibus vel interdum furcatis 3–6-fasciculatis continuis flavo-brunneis 20–25 μ diam. circa 2 mm. altis basi stolones longos emittentibus; sporangiis globosis circa 250 μ diam. brunneo-nigris opacis glabris; columella subglobosa; sporis subglobosis minutissime striatis 5–6 μ diam. pallide olivaceo-brunneis; zygosporis doliformibus 100-120 μ diam. hispidis subnigris.

Parasitic on bulbs of various species of *Lilium*.

Japan.

Summary.

The lily bulb disease is caused by a parasitic fungus called *Rhizopus necans*.

The fungus cannot penetrate the unbroken tissues of the bulb, but gains an entrance through wounds, more especially broken roots.

The amount of evidence forthcoming indicates that the bulbs are not diseased until after they are removed from the ground.

The spores of *Rhizopus necans* are killed by a short immersion in a 1 per cent. solution of corrosive sublimate or of salicylic acid.

* New Jersey Agric. Coll. Expt. Station, Bull. n. 76.

Neither of these substances have any injurious effect on living bulbs, provided they do not remain in the liquid for more than fifteen minutes.

Preventive Measures.

The fungus is by no means confined to lily bulbs for its food; but, as experiments have proved, can live on a great variety of dead or decomposing substances; it may also occur as a parasite on other plants than lilies in Japan as it readily attacks and destroys daffodil bulbs. Judging from the enormous amount of injury caused, it would appear that the fields where the lilies are grown, must be saturated with the fungus, growing indiscriminately on various substances, and attacking the lily bulbs, along with other things, as a matter of course. If practicable, entirely new localities should be selected for the work. Even if this were done, great care would have to be exercised, so as not to introduce the fungus; the spores are readily conveyed from one locality to another in the soil on tools, cart wheels, shoes, clothing, &c., in addition to being carried by wind or animals. An important point to remember is not to allow vegetable rubbish of any kind to accumulate, and all diseased bulbs should be burned and not allowed to remain on the ground, otherwise the zygospores that form on such old decaying bulbs would start the disease the following season.

As little injury as possible should be done to the roots of the bulbs when they are removed from the ground, and the bulbs should be allowed to "sweat" before they are packed for exportation. If the fungus is known to be present when the bulbs are being prepared for packing, they might be placed in a solution of salicylic acid as advised.

The sterilised earth in which the bulbs are packed appears very suitable for the work, and cannot be in any way considered as a cause of the disease.

G. Massee.

Description of the Figures.

1. Section of a diseased lily bulb; the dark portion at the base of the bulb is the part attacked by the fungus; nat. size.

2. Portion showing the fungus in the fruiting condition, growing on the roots of a lily; × 2.

3. Clusters of fruit-bearing branches of the fungus; × 8.

4. A single cluster of the sporangial form of fruit; × 60.

5. Diagramatic section of a sporangium; *a*, columella; the portion, *b*, between the columella and the outer wall of the sporangium is filled with spores.

6. Spores, some of which are germinating; × 300.

7. Spores showing the delicate markings on the epispore; × 1,000.

8. Mature zygospore; × 300.

9. Mycelium of the fungus running between cells filled with starch; × 400.

DXLIV.—TENGAH BARK.

The species of the small natural group of Mangroves form one of the most characteristic features of the muddy tidal estuaries of the tropics. *Rhizophora*, the typical genus, is found in both the old and the new world; the others are confined to the former.

The *Kew Bulletin* for 1892 (pp. 227–232) contained a full account of an attempt to introduce West Indian Mangrove bark into European commerce as a tanning material.

The present correspondence gives the available information respecting one of the East Indian Mangroves, *Ceriops candolleana*, which appear to be attracting some attention.

Director, Gardens and Forest Department, Straits Settlements, to Royal Gardens, Kew.

Singapore,
November 8, 1892.

Dear Mr. Thiselton-Dyer,

I am sending you a small box of extract of Tengah bark (*Ceriops candolleana*). This bark is used here for tanning, and also for dyeing, especially in conjunction with Indigo. The bark was cut up in bits and boiled for two hours in a copper pan, and the liquid eventually dried by heat.

In dyeing, it is used to give a brownish red colour to cloth, but especially to get good black and purple. The cloth is first dyed in Tengah, dried, and then dipped in Indigo, and comes out purple or black according to the strength used.

The tree is very common here and used as firewood, and the bark mostly wasted. So it could be prepared at no great cost. I should be glad if you would get an opinion on it either as either a dye or a tan.

Mangrove extracts have, I believe, been tried before, but have not been successful, because there has not been any attempt to discriminate between the species, but all kinds of barks have been stewed up together and the result tried. Now, I am going to work through all the Mangrove tan barks one by one, and try if we cannot make some use of them.

Yours, &c.
(Signed) Henry N. Ridley.

Note by the Professor of Dyeing, Yorkshire College, Leeds.

"Tengah" bark extract behaves, as regards its dyeing properties, in a similar manner to a good quality of Catechu.

When used along with Indigo, as is apparently the practice, the latter is probably applied in a "copperas" (ferrous sulphate) vat; in which case the "Tengah" will combine with the iron and produce, as indicated above, a grey colour, which in conjunction with the Indigo blue gives the black.

Tengah extract would certainly be of value to dyers.

(Signed) J. J. Hummel.

February 8, 1893.

MESSRS. WALLACE BROTHERS to ROYAL GARDENS, KEW.

8, Austin Friars, London, E.C.,
February 11, 1897.

SIR,

WE are sending you by parcel post a sample of Mangrove bark from British North Borneo, which we understand is known there as Kulit Tengah Mangrove. From this bark a substance is produced which is used largely in dyeing, and we shall feel much obliged if you will inform us whether the particular description of Mangrove tree from which this bark is produced is found in British Burma. There are, we know, large quantities of Mangrove trees in Burma, but we are not sure if they consist of the particular description represented by the sample we are sending you.

We understand that the common Mangrove, generically known in Borneo as Bakau, also produces a dye, but of a darker colour than the Tengah.

Perhaps you can oblige us with the botanical names of the Tengah and of the common Mangrove.

We are, &c.
(Signed) WALLACE BROTHERS.

W. T. Thiselton-Dyer, Esq., C.M.G., F.R.S.,
Director, Royal Gardens, Kew.

ROYAL GARDENS, KEW, to Messrs. WALLACE BROTHERS.

Royal Gardens, Kew,
February 12, 1897.

SIRS,

I AM in receipt of your letter of yesterday's date.

Tengah bark is an article known to us only from the Straits Settlements. Its botanical name is *Ceriops candolleana.* It belongs to the mangrove family, and no doubt occurs both in Borneo and in all the tidal rivers of British India. It has been studied in the Leeds Dyeing School, and was regarded as " of value to dyers."

2. I should be disposed to regard the article known as " Bakau Cutch " as possibly derived from the same plant as the " Tengah extract."

3. The two species of mangrove which are widely dispersed throughout the eastern tropics are *Rhizophora mucronata* and *Rhizophora conjugata.*

I am, &c.
(Signed) W. T. THISELTON-DYER.

Messrs. Wallace Brothers,
8, Austin Friars, London, E.C.

DXLV.—WEST INDIA SUGAR TRADE.

The following article is reproduced from the *Times* of November 30th last. It gives an extremely clear account of the state at that date of the problem of sugar cultivation in British Colonies and the cause of its decay. And it is the more valuable as it does this from an impartial and independent point of view :—

" The position of the West Indian sugar trade, which has led to the appointment of an Imperial Commission to proceed to the West Indies

and inquire on the spot into the conditions of the sugar industry, with a view to ascertaining whether any effective measures can be devised for its development and relief, is one which can hardly fail to arouse both sympathy and interest.

"It would be in every sense undesirable, on the eve of such an inquiry as is now about to be held, to take conclusions for granted on the many controversial points with which the subject bristles. There is no necessity to assume, on the one hand, that the industry is the altogether hapless victim of circumstances which are beyond the range of possible control, or, on the other, that with proper exertion on the part of those who are most largely interested the evils complained of might in spite of circumstances have been surmounted. An unbiassed statement of facts, a due apportionment of praise and blame, an unprejudiced recommendation of the proper remedies are what the public will look for from the Commission. In the meantime a bare outline of the situation as it presents itself, whatever the causes or combination of causes by which such situation may have been produced, will indicate the urgency of according full consideration to the question.

"It has to be borne in mind that the West Indian colonies are principally agricultural in their resources. With the exception of British Guiana, where the development of the gold industry is now confidently expected, they have so far given little indication of mineral wealth. Their position and the nature of their labouring population preclude the idea of manufacturing development on any important scale. Amongst their agricultural productions sugar has hitherto held the principal position. In British Guiana, which is the largest sugar-producer of the group, the sugar industry, notwithstanding the promise of other developments in the near future, is still spoken of as practically the only industry of the country. It is the industry which has hitherto contributed the principal revenue. It is also, it should be added, the industry in whose interests the incidence of taxation of the colony has been principally adjusted. It is worth stating, as having a possible bearing upon the future solution of present difficulties, that, although the cultivation of sugar has hitherto occupied this very prominent position in the agricultural production of British Guiana, there is no natural dearth of other tropical products which might in favourable circumstances be brought into commercial cultivation. In Jamaica the proportion of sugar cultivation to other agricultural production has of late years diminished, and the prosperity of the colony stands on a wider basis. Bananas and other tropical fruits, cacao, coffee, cocoa nuts, cinchona bark, &c., form a considerable item in the trade of Jamaica. The development given to the fruit trade and the fibre industry in the Bahama Islands proves the value of products which have hitherto been regarded as possessing only minor importance in the possible resources of tropical and sub-tropical agriculture. In relation to these as yet scarcely developed possibilities, it has been pointed out that we have 'in British Guiana alone an area of country equal to two Ceylons quite untouched; in British Honduras we have more than the area of the Fiji Islands; to Trinidad we could add the wealth of the Straits Settlements, and with the resources of the unworked soil of Jamaica we might emulate the prosperity of at least four colonies of the size of Mauritius.'

"Acknowledging to the full all that there may be to urge in favour of further development of other agricultural resources, we must, however, recognise that sugar is at present and has been for many years past the principal mainstay of West Indian production. In British Guiana

sugar and its accompanying products have been calculated to contribute 92 per cent. of the total exports, in Barbados 94 per cent. St. Kitts, St. Lucia, St. Vincent, and other smaller islands are in a very similar position. In Jamaica, notwithstanding the development of other industries, sugar only forms 20 per cent. of the total export.* Trinidad, happy in the possession of a pitch lake, counts sugar as its staple production. With rare exceptions the West Indian Colonies may be correctly stated to regard the prosperity of the sugar industry and the prosperity of their local populations as synonymous terms. Depression in the sugar trade means for them financial embarrassment in private circles, diminution of the public revenue, discontent among the labouring population.

"It is a matter of common knowledge that depression in the West Indian sugar trade has now reached a point at which estates are going out of cultivation in some of the leading sugar colonies, and very serious consequences are anticipated both to the public and to the private prosperity of the colonies affected. Remedial measures have become urgently necessary in order to avert grave disaster. The cause of the crisis is not to be attributed to a lessened demand for sugar in the markets of the world, nor to a diminished power of production. The total sugar production of the world for the year 1880 was 3,830,000 tons. The total production of the world for the year 1895 was 7,879,000 tons. The increase is large for a period of 15 years, and if the West Indian Islands had kept a fair proportion of the increased production in their hands they ought to have no reason to complain. Unfortunately, this is not the case. The sugar of the world is of two kinds, cane sugar and beet sugar. The West Indians are producers of cane sugar alone, and when the total of the world's sugar production is divided under the two heads of cane and beet it will be found that the increased production has been almost wholly in beet sugar. The figures for 1880 are:—Cane sugar, 2,200,000 tons; beet sugar, 1,630,000 tons; and the figures for 1895 are—cane sugar, 2,904,000 tons: beet sugar, 4,975,000 tons. Nearly the whole increase has been made in the production of beet sugar, and while these large quantities have been added to the general supply placed upon the markets of the world, the production of cane sugar in the West Indian colonies has remained for many years in quantity almost stationary. Had it remained stationary in value the situation might still have been endurable, but the natural effect of increased supply in bringing down the level of prices has been artificially heightened by a system of foreign bounties, on the one hand. and of duties, on the other, until in the course of last year prices fell to something not far from 50 per cent. of the values realized in the comparatively recent days of West Indian prosperity, According to a statement made before a local Commission, appointed in 1894 to inquire into the matter, in British Guinea a ton of refined cane sugar cost 14*l.* 15*s.* 10*d.* to produce, and its average value in the market at that time was 13*l.* 19*s.* 2*d.* Under these conditions the more sugar the West Indian planter produced the greater was the loss he suffered.

"The conditions of production of beet sugar appear to have been in themselves scarcely more profitable. The total production of beet sugar for 1894 was estimated in round numbers at 5,000,000 tons, at a cost of 9*l.* a ton. The price realized for beet sugar was 8*l.* 15*s.* a ton, representing what would under ordinary conditions have been a total loss to the beet-sugar industry of 1,250,000*l.* But the annual sum paid in bounties by the foreign Governments under whose protection the beet-sugar industry is fostered, amounted for that year to 4,290,000*l.* If the

* The *Times* stated 60 per cent. But this was an obvious error.

figures are correct, the beet sugar industry, working at a commercial loss, received from the taxpayers of the countries in which it is located a sum which represented the very respectable profit of 3,040,000*l*. The bounty being paid at so much a ton, the beet-sugar grower has every incitement to continue to produce so long as what may be termed his political gain outbalances his commercial loss.

"Under such conditions of competition with regard to production the West Indian planter may be pardoned if he has his moments of something approaching to despair. His hope would have been that an unrestricted demand might keep pace with the artificially increased supply, and that thus prices would in due course recover their balance. Here, again, the Continental system is against him. In Great Britain, where there are no duties, the consumption per head of the population reaches 73 lbs. In France, where there is a duty of 24*l*. a ton, consumption falls to 28 lbs. per head of the population. In Germany is is 26 lbs. a head, in Austria it is 17 lbs. Thus, while the production is, on the one hand, stimulated by bounties, consumption is, on the other hand, restricted by duties. Supply is artificially increased, demand is artificially diminished, and the interference with economic law is complete.

"The situation as it is offers, however, certain elements of hope. In the first place, the burden of the bounties on the taxpayers of the Continent, becoming every year more weighty, tends by that very fact to bring about its own cure. At the present rates of bounty a crop such as that of last year involves an annual cost in round numbers of almost 5,000,000*l*. to the bounty-giving Governments. Every further fall in price further increases the burden, and a decrease of 1*l*. per ton in the market price would mean, at present rates of production, a further charge of 5,000,000*l*. The most patient taxpayers revolt when such charges for the benefit of one industry are piled too indiscriminately upon their budget, and there are signs that the bounty system of Continental nations cannot last for ever. Again, although in presence of the consumption of 73 lbs. per head of sugar by the population of Great Britain the restrictions placed upon the consumption of the Continent may present a source of somewhat bitter reflection to the sugar grower, there is comfort in the reflection that the powers of consumption of the world's markets have by no means reached their limits, and that, if by any change of policy the duties should at some future time be diminished, the demand might readily be doubled. If by the removal of bounties production were reduced to its natural level, and by the removal of duties demand were allowed to reach its natural limits, there would be room for growers of both cane and beet, and all might yet be well with the sugar industry.

"The pressing question for the West Indian sugar growers is how to hold out till this favourable change shall take place. Representations of the necessity for action of some kind have poured in upon the Imperial Government, in the form chiefly of petitions for relief, from the principal sugar colonies, and it is perhaps not altogether unnatural that, foremost among the proposals of the suffering planter, is the request that his production of sugar also might be supported at the cost of the taxpayers by a system of English bounty and the imposition of countervailing duties at English ports. He is so urgently in need of money that any means by which it may be obtained would be acceptable to him.

"That men seeing themselves on the verge of grave disaster should be willing to snatch at any means in their power to avert the peril is

comprehensible, but that any radical improvements in the conditions of the industry could be brought about by a further stimulus to supply accompanied by a further restriction of demand is a view which will hardly be accepted by the disinterested observer. To grant this form of relief would be to prolong indefinitely a position which can only lead to further mischief and extend the area of inevitable industrial disaster. Other means than these must be found to enable the West Indian industry to live through the present period of depression.

"It must not be forgotten that at this moment there is a portion of the Empire in which the cane sugar industry, suffering as it necessarily has done from the late fall in prices, is nevertheless in a condition of prosperity, not only holding its position in the teeth of adverse fortune, but expanding and strengthening its position. The Queensland sugar industry has gone through its dark hours. The old system of large plantations has been pronounced a failure. A large proportion of the planters engaged in the industry were ruined. The industry has been forced to undergo a searching and painful process of re-organisation. But, under the new system of small plantations and large central mills, it is not only bringing in a fair return for the capital invested in the sugar factories, but it has been instrumental in settling a prosperous class of small farmers and peasant proprietors upon the soil.

"In connexion with the possibilities of reorganisation it is sufficient for the moment to indicate one point. In evidence given before the Commission held in British Guiana it was stated that a ton of sugar cost almost 14*l.* to produce, and that one-half of the cost—that is, 7*l.*—might be put down to labour. It has also been estimated that a well-equipped estate in British Guiana, producing about 3,000 tons of sugar, will employ about 1,500 labourers besides mechanics and a management staff. Under the new system of organisation in Queensland an estate of similar capacity, producing about 3,000 tons of sugar, will employ about 212 whites, including mechanics, and 420 coloured labourers, giving a total of 632 hands. Throughout the plantations it has been found that the new system of small proprietors has had for one of its effects the general reduction of the labour bill by one-half. Apply this rule to the ton of West Indian sugar, of which it was stated that the cost in labour of production was 7*l.*, and a saving of 3*l.* 5*s.* per ton would at once be effected. Three pounds five shillings saved in cost of production would be more valuable than any bounty which is at present paid by Continental nations, and, if the remedy be applicable, would alone suffice to save the West Indian sugar industry.

"To assume that the conditions are exactly similar and that any exact parallel can be drawn would be unjust until the conditions have been more fully inquired into. The argument indicates only possibilities which may exist, and may, for causes unknown to us, have been overlooked. A commission of competent investigators able thoroughly to examine the whole position need not begin their labours without hope of arriving at some practical solution of the difficulties with which the sugar industry is confronted, and if it should be found possible to include in the commission some members having knowledge of the conditions of the sugar industry in Queensland the chances of success will be materially increased."

DXLVI.—PRICES OF HOME-GROWN TIMBER for 1896.

The following article reprinted from the *Gardeners' Chronicle* of January 2, of the present year, is a useful summary of the prices of home-grown timber during the preceding one. The subject is one of frequent inquiry.

During the year 1896 "the prices of home-grown timber and forest produce generally, cannot be said to have greatly improved. Certainly, the demand for almost every class of timber has increased appreciably during the last three months, and for certain kinds it may truthfully be said that the demand greatly exceeds the supply. This is especially true with oak, ash, and larch of good quality and large size, these meeting with a ready sale at fair prices. Large clean oak fetches from 1*s*. 8*d*. to fully 2*s*. per foot, and several small parcels of special quality changed hands of late at prices even in excess of any just named. Ash, too, finds a ready market at 1*s*. 8*d*. per foot, and that of extra good quality was sold at an auction lately for 2*s*. per foot. Of course, the difference between clean grown plantation trees, and those from the field and hedgerow is apparent to everyone interested in the conversion of our home-grown woods, and the purchaser pays accordingly. Elm is still a drug in the market, and plenty, of perhaps not the best quality, can be got at the low figure of 6*d*. a foot, and a large batch of roughish trees recently was sold for 4*d*. a foot. Large and sound sycamore finds a ready market at highly remunerative prices, and I recently sold a number of first-class trees at 2*s*. 6*d*. per foot, but from 1*s*. 8*d*. to 2*s*. is nearer the mark generally.

"Then, 'maiden' willow, if fit for bat-making, finds a quick sale at high prices, and here again the supply falls far short of the demand. Beech, such as that produced on the Chiltern Hills, and in certain parts of Kent, Surrey, and Hertfordshire, sells readily at fully 1*s*. per foot, though 8*d*. is the average price in most parts of the country. The demand for this class of timber is very good at present; but rough, knotty small stuff can hardly be sold at even firewood price.

"Both alder and birch fetch 10*d*. per foot, especially in districts where the making of clog-soles is a part of the industry.

"Larch sells perhaps more readily than any other of our home-grown timbers, the quantity of this on hand at the present time being small indeed. From 1*s*. to 1*s*. 3*d*. may be considered fair for that of good quality. Scotch fir, on the other hand, is hard to get rid of even at the low figure of 6*d*. per foot, and there are lots at present offered below that price.

"Oak-bark is gradually deteriorating in value, and about 3*l*. 12*s*. was paid for large quantities during the past season. When we count 30*s*. per ton for barking and harvesting, and a further few shillings for delivery and supervision, the profits attending such a precarious commodity as oak-bark, even in an ordinary season, are hardly commensurate with the risks involved. Large faggots used to sell readily at 22*s*. per 100, but plenty are waiting to be sold at 12*s*. in the London market. Small faggots for fire lighting—"pimps" they are called in southern England—can now be bought in the city at 2*s*. 6*d*. per 100—a contrast to the 4*s*. 6*d*. readily got not so many years ago. The split batten ends, now offered for sale by almost every grocer, have quite ousted the faggot from the market.

"Coppice-wood, too, does not fetch one half of what it did twenty years ago; that of sixteen years' growth, and composed mainly of ash and hazel, selling at the present time at from 5*l.* to 6*l.* per acre.

"It is confidently to be hoped that the rather brisker trade and better prices of home-grown timber and other forest produce during the past three months will fully maintained, if not increased, during the year 1897.—*A. D. Webster.*"

DXLVII.—MYRRH.

In the *Kew Bulletin* for 1896 (pp. 86-91) an attempt was made to settle the botanical origin of myrrh. The publication of this paper has led to some fresh investigations by Dr. Schweinfurth and Mr. E. M. Holmes, Curator of the Museum of the Pharmaceutical Society. These made some further discussion of the subject necessary.

1. *Balsamodendron Myrrha* was described by Nees from Ehrenberg's specimens. They were sent from Berlin for Dr. Trimen's examination. He remarks (*Medicinal Plants*, sub. t. 60) "the whole available material is quite insufficient to enable a sound opinion to be formed as to whether *B. Myrrha* is a distinct species."

Dr. Schweinfurth has very kindly sent to Kew an analysis of the single fruit accompanying Ehrenberg's specimens, and presumably belonging to them. This indicates the validity of the species satisfactorily. It further leaves no doubt that the plant collected by Schweinfurth in the Yemen district may be referred with certainty to this species.

2. The fragmentary specimen collected by Captain Hunter at Aden, and labelled by him "true Myrrh," also probably belongs to it (*Kew Bulletin*, 1896, p. 90).

3. Mr. Holmes has cultivated in a remarkable manner the appreciation of distinctions of taste as a means of testing the identity of plants. Such an acquirement is simply invaluable in pharmacological investigation. Using this criterion he has discussed the subject in the *Pharmaceutical Journal* (Dec. 12, 1896, pp. 507, 508). He points out that true myrrh has a very bitter taste and a peculiar aroma, hardly likely to be absent in the plant itself. This bitter taste he finds:—(i) in Schweinfurth's specimens of *B. Myrrha* from Yemen; (ii) in Captain Hunter's specimens from Aden; (iii) in Mr. Wykeham Perry's specimen from the Fadhli district which Trimen (*l.c.*) identified with *B. Myrrha*, but which was referred in the *Kew Bulletin* (l.c. p. 90) to *B.* (Commiphora) *simplicifolium*, having been previously ("Kew Report," 1878, p. 40) conjectured to belong to *B. Opobalsamum*.

4. The evidence taken together seems to be sufficient to allow us to regard all three plants as belonging to the same species, and as affording Arabian Myrrh. The objections are:—(i) that Fadhli myrrh is said to give a violet colour with bromine, which Yemen myrrh does not; (ii) that *B. Myrrha*, according to Schweinfurth, is completely inodorous, and does not produce any resin. Mr. Holmes meets the latter difficulty by suggesting that Schweinfurth has been misled as to the plant. There may also have been easily some confusion as to its botanical identity. Professor Engler has in fact mixed up with *Balsamodendron Myrrha*, *B. Playfairii*, which certainly does not produce true myrrh.

5. As to Somali myrrh, Schweinfurth has again kindly furnished an analysis of the identical specimen collected by Hildebrandt, and figured by Trimen in *Medicinal Plants*, t. 60. Engler and Schweinfurth identify it with *Balsamodendron Playfairii*, the source of Gum Hotai. In this they are certainly mistaken. As stated in the *Kew Bulletin* (*l.c.*, 87):—"It is apparently closely allied to *Balsamodendron* (Commiphora) *Schimperi*." Holmes objects that this has a turpentiny but not a bitter taste. Schweinfurth, however, regards *B. Schimperi* (*Kew Bulletin*, 1896, p. 89) as one of the sources of Arabian myrrh. In any case the origin of Somali myrrh cannot be said to be satisfactorily cleared up. As the country is now often visited by travellers it is much to be desired that the plant really yielding its myrrh may be conclusively determined by the collection and examination of adequate specimens.

6. In the *Kew Bulletin* (*l.c.* p. 91) it was suggested that *B. simplicifolium* may be accepted as the source of Yemen myrrh. It since appears that under the names *Commiphora simplicifolia*, Schweinfurth inadvertently distributed two species:—*B. Schimperi* and *B. simplicifolium*; the latter is now reduced by him to a variety of *B. abyssinicum*. He remarks in a letter that "the simple leaves are only due to the season and to the short branches; the same thing happens with the Abyssinian *C. abyssinica*" according to Deflers, cited in the *Kew Bulletin* (l.c. p. 90), this species yields myrrh both in the Fadhli and Yemen districts. Schweinfurth, however, adds in the letter with which he has kindly furnished me:—"Fadhli myrrh is partly yielded by *C. abyssinica* as proved by M. Deflers; but *all* Fadhli myrrh may not be yielded by it. We cannot accept this plant as its only source. I did not visit the districts where myrrh is collected in Yemen; this was to the north of the region explored by myself. M. Deflers did visit it, but he did not collect specimens of the myrrh plant *there*."

7. Whether *B. abyssinicum* is really a source of myrrh is not of very great importance as, thanks to Mr. Holmes, we seem to be on safe ground in accepting its old attribution to *B. Myrrha*.

W. T. T. D.

DXLVIII.—BOTANICAL EXPLORATION IN YUNNAN.

Dr. Henry, the well-known Chinese botanist, is now stationed in Yunnan. The following extract from a letter recently received from him gives some interesting particulars of this botanically rich region:—

Customs, Mengtse, par Laokay, Tonking.
Sept. 5, 1896.

"As regards botany, *e.g.*, this region—on the outskirts of which I was stationed at Ichang, and now am here again on another border of it at Mengtse—is, I imagine, the most interesting in the world. It is evidently the headquarters of most of the genera which are now spread all over Europe and Asia in great part. The geology is quite unknown and it is a combination of knowledge of the ancient history of the region geologically, and of the flora, which will explain much that is obscure in the present distribution of species. I have told you of the immense, universal and peculiar deposit of red clay which covers Yunnan, extending into the Shan States. This perhaps speaks of glaciation and perhaps it is to glacial phenomena that the present richness of the flora is due.

"I intend to go on collecting vigorously, and hope to rival Delavay in Yunnan. His 3000 species will be hard to beat.

"The country immediately around Mengtse is not so very rich, as it bare of wood and water: but in all directions at two to four days' distance there is splendid country. I have just had a native collecting in the mountains south of the Red River near the French frontier, and he has brought back from the virgin forests of a high mountain about 100 interesting species, *e.g.*, he has re-found *Tetracentron* (a genus of *Trochodendriæ*) perhaps a new species, at any rate a variety, of the Hupeh plant. He has also brought me undoubted *wild tea*. Hitherto the tea plant has been found wild only in Assam, the cases of its spontaneity recorded from China being very doubtful. In all my trips in Szechwan and Hupeh I never met it. The present specimens are above suspicion, coming from virgin forest, and at an immense distance from any tea cultivation, the nearest being P'u-êrh 200 miles west. Bretschneider in *Botanicon Sinicum* part II., p. 130, has some remarks on the antiquity of tea in China, and it was not till the sixth or seventh century that it came into general use. It is probable that it was found wild in these southern provinces, which did not form a part of the ancient Chinese empire, and I daresay it will be found wild in these mountains from Mengtse to Szemao. It is not probable at all that tea came from so far away as Assam.

"My native also brought back some interesting ferns, pretty *Cyrtandreæ*, &c., and some specimens in fruit of the curious *Lysimachia*, the leaves of which have a delicate but strong fragrance. They are used for scenting hair-oil by the Chinese. Perhaps some of the seed is ripe enough for me to send to you for cultivation.

"I have had enquiries from a London firm about soap trees. They wish to buy the fruits of these in quantity, as they have brought out some patent or other, which demands a large consumption of these fruits. I presume the *saponin* therein is the base of the patent (for washing fine fabrics, hair-wash, &c., perhaps). They didn't say what their patent was.

"A large number of soap-trees occur in China, and I would write a note for the *Bulletin* on the subject, as it is of perhaps considerable commercial importance, but one thing is wanting. The species of *Gleditschia* require revision. Four are mentioned in the *Index Fl. Sin.*, I., p. 208 *et seq.*, but since then there is a new one from Hupeh and another from Yunnan. There were also specimens of mine at Kew from S. Formosa which are not yet matched with any described species.

"The chief soap-trees are *Sapindus Mukorossi*, *Gymnocladus sinensis*, and all the species of *Gleditschia*, except *G. officinalis*, Hemsley, which has a small pod only used as a drug. The fruits of these are very generally used in China in lieu of soap, and for washing the hair the Chinese ladies say they are superior to alkaline soaps.

"I have tried, in vain, to get a Lolo teacher to instruct me in the language and teach me their method of writing, now almost gone out of use, if not entirely. The MSS. of the Lolos are as yet undeciphered.

"I told you about the plague, its ravages amounting to actual decimation of the inhabitants of Mengtse town. It suddenly ceased on or about the 8th August, a few cases having appeared in the surrounding villages just before, and it is now gone completely from this neighbourhood, though I hear it is now prevalent in a town some 20 miles away on the other side of our mountains.

"My collector also found some *Laurineæ*, the absence of which was rather puzzling to me. I am sending him off in another direction in

a day or two. The mountains he botanised over he described as lofty and covered with thick forest of immense trees. Bears occur there, a sure sign of virgin forest, as far as my experience goes in China.

"I have little more to add, as I have not been away lately on any interesting trips, I, however, find much to interest me in the mountains around: it is not everywhere you come across plants you have not seen before almost every day. The orchids are plentiful and rich in species.

"This place is isolated in the extreme, and it takes such a time to receive letters. As regards stores, they come after delays of months. I have nearly finished all my shoes, and there are new pairs I hope all along the way, but they do not seem to come.

"It is rather easy travelling about here, as mules are cheap and numerous. I have just had a tent made for trips. The savage villages in the mountains are too dirty to stay in, even if one always found these queer folk in the humour to take one in. What I mean by 'too dirty' is something awful, as I put up quite comfortably with the huts of the Chinese in Hupeh, which were comparatively clean.

"The Chinaman is of course superior to these Shans, Lolos, Miao-tzu, in energy and various other laudable qualities, but the Miao-tzu and true Lolos of the mountains have more pleasant manners in many ways, at least I like their looks and way of talking.

"Does no geologist ever dream of investigating these regions? Yunnan is well known for its mineral wealth. It is easy enough now getting here from Hongkong by way of Tonking."

DXLIX.—KINO FROM MYRISTICA MALABARICA.

An astringent, red, resinous substance obtained from the sap of various trees of tropical countries is known as Kino. The best medicinal kind which contains 75 per cent. of tannic acid comes from the Indian Kino tree *Pterocarpus Marsupium*, Roxb. while Bengal Kino is obtained in the form of round tears of an intense ruby colour from *Butea frondosa*. Kino is usually used in medicine for its astringent properties in cases of diarrhœa, chronic dysentery, &c.

Among the various specimens obtained for the museum of the Royal Gardens from the International Forestry Exhibition held in Edinburgh in 1884, was a peculiar dark resinous substance labelled "Kât jadikai" or Kino obtained from *Myristica malabarica*. It formed part of a collection of products made by Mr. Rhodes Morgan, District Forest Officer, Malabar.

In appearance the substance is very much like that obtained from *Pterocarpus Marsupium*. It has since been examined by Professor Edward Schaer, of Strasburg, who has communicated an interesting account of it to the *Pharmaceutical Journal* (4th series, Vol. III. p. 117), from which the following extracts are taken:—

"Professor Warburg, of Berlin, has kindly forwarded to me a sample of an extract or secretion resembling official Kino which with well known liberality had been put at his disposal by the director of the Royal Gardens, Kew. The sample in question labelled 'Kât jadikai,' that is to say cutch-like product of jadikai (Tamil name for *Myristica*), and known to be produced by incisions in the bark of *Myristica malabarica*, Lam., in Southern India, showed in its exterior appearance more direct analogy to the well-known Malabar Kino than to the 'Kâts' of *Acacia* (Cutch) or of *Uncaria* (Gambier). It consisted like officinal

Kino of smaller or larger angular transparent pieces of a deep garnet colour in thin fragments. It was not altogether unlike small broken dragon's-blood in some respects, and the latter name has been used sometimes by natives and merchants for some kinds of kino (from *Pterocarpus indicus* and *P. erinaceus*).

"Not having been acquainted before that time with kino-like products from the genus *Myristica*, and following the suggestion of Professor Warburg, who was then preparing a monograph of the Myristicaceæ, I at once proceeded to a closer examination of the new substance, availing myself of the latest observations concerning the natural history of the different kinds of kino, especially of the drug derived from *Pterocarpus Marsupium* (Malabar kino). Not only on its external appearance but also in its behaviour to water and other solvents, the 'Kât jadikai' or kino from *Myristica malabarica* agreed almost entirely with *Pterocarpus* kino, giving a reddish, slightly turbid solution of feebly but perceptibly acid reaction to litmus paper. The other physical qualities, for the most part proved to be the same at those described by Hanbury and Fluckiger (*Pharmacographia* II. Ed. 1879, p. 195). The same may also be stated concerning the more important and characteristic chemical reactions when compared with the chemical behaviour of official kino."

Professor Schaer thus summarises the results of his investigations into this and some other kinds, the produce of species of *Myristica*.

I. The dried juices of the bark of several Asiatic species of *Myristica*, for instance, of *M. malabarica*, Lam., and *M. fragrans*, Houtt., as regards their appearance and physical qualities, show but little difference from the officinal Malabar Kino.

II. These substances, which may be termed Myristica Kinos, agree in the chemical reactions due to their constituents, in all important points, with the Kino of *Pterocarpus Marsupium*. It can therefore be stated that drugs of a very similar character, and partly of close resemblance to official kino, are to be found in the families of Leguminosæ (*Butea*, *Pterocarpus*, *Millettia*), Saxifragaceæ (*Ceratopetalum*), Myrtaceæ (*Eucalyptus, Angophora*), and Myristicaceæ.

III. The *Myristica* Kino differs, as far as can be observed from the *Pterocarpus* Kino, and probably also from *Butea* and *Eucalyptus* Kino, by containing, in the crude state of the inspissated fresh juice, smaller or larger amounts of a distinctly crystalline calcium salt, viz., calcium tartrate, suspended in, and depositing from, the liquid juice. By this characteristic admixture it can be easily distinguished from the official Kino, and probably also from other Kinos of commerce.

Whether this new substance might ever be obtained in combination with the production of nutmegs and mace, so as to play the part of a commercial drug, will depend upon a still better knowledge of its qualities, its formation in the living plant, its quantitive relations, and similar questions.

DL.—CULTIVATION OF COTTON IN EGYPT.

(*Gossypium barbadense*, L.)

Next to the United States and India, Egypt is one of the important cotton-producing countries of the world. The quantity of Egyptian cotton received in this country is about 2,000,000 cwts. annually. The

quality is usually exceptionally good, and ranks next to the celebrated Sea-island cotton of America.

The following sketch of the history of cotton cultivation in Egypt lately appeared in *Journal of the Society of Arts* (December 25th, 1896, pp. 98, 99).

"Some interesting information is given in a recent issue of the *Bulletin du Ministère de l'Agriculture* respecting the different descriptions of cotton which have been successively cultivated in Egypt. The first cotton cultivated in the delta of the Nile was called *Jumel*, after the name of the person who introduced its cultivation, in the reign of Mehemet Ali, in 1820. M. Jumel, who was a Frenchman, had remarked in the garden of one of his friends living near Cairo, certain cotton plants, of which the seed had been imported from the Soudan. He succeeded in cultivating the plant from seeds which he obtained, and presented certain of them to Mehemet Ali, who, foreseeing the sources of wealth that the cotton might assure to the country, placed at the disposal of Jumel vast extents of territory, and gave him every facility in his enterprise. This cotton was also known by the name of *Mako*, after a bey in whose gardens Jumel had originally found the first seeds. *Jumel*, or *Mako*, was for many years the only cotton cultivated, but for a time it was replaced by a new variety called *Ashmouni*. This *Ashmouni* degenerated after 20 years of cultivation, and was abandoned for *Mit Afifi*, which at the present time is most largely cultivated in Egypt. *Mit Afifi* is a very strong variety of cotton, easy to grow, and does not require any very excessive irrigation. The colour is slightly yellow and is much appreciated by spinners. Another kind of cotton called *Bahmieh** is grown to a limited extent, and this is a delicate variety requiring a stronger soil. It yields a whitish cotton, which is particularly used for certain articles of hosiery. It enjoys a great reputation in the United States, while France and Germany consume small quantities of it. The cultivation of the varieties called "white cotton" has very considerably fallen off. Their total annual production hardly exceeds from 60,000 to 70,000 quintals. Many other varieties, such as *Zafiri*, *Abbassi*, &c., have been experimented with by many growers, but up to the present the results have not been sufficiently advanced to enable an accurate opinion to be formed as to their merits. Egyptian cotton, whatever its variety, preserves its essential qualities, which causes it to be much sought after by European and American manufacturers. As a matter of fact, no cotton, with the exception perhaps of Sea Island, the production of which is to some extent restricted, and the price too high to admit of its general and universal consumption, has the fineness, the strength, and the brilliancy necessary for the manufacture under good conditions of a large number of special articles. Egyptian cottons are used in making threads of the numbers 60 to 150, while Indian cotton makes threads of numbers 5 to 18, and American cotton threads from 20 to 50. The qualities of Egyptian cotton are such that it finds a ready outlet on European markets, no matter what may be the production and prices of cotton of other origins."

The following further information respecting Egyptian cotton is taken from the *Journal of the Royal Agricultural Society*, vii. 627, and contains notes on the use of manures for increasing cotton crops in the Nile Valley:

"It is to the cotton crop of the Delta that Egypt owes its present financial prosperity. It covers between a third and a half of the area,

* An account of Bahmieh or Bamia Cotton is given in the Kew Report for 1877, pp. 26, 27.

the remainder being uncropped in the summer, but cropped with maize in flood-time. During the winter the country is an uninterrupted expanse of wheat, barley, and clover. The cotton is sown in March, and is on the ground till the end of October, receiving about 14 waterings, of which nine are given during the hot weather by lift with bullock-wheel or steam-pump. Its produce is at least eight times that of Indian cotton, giving an average of about 500 lb. of lint per acre. Clover or wheat follows.

"The clover is sown amongst the cotton plants before they are cut, and gives five cuttings between November and June, requiring eight waterings. Maize follows during the flood, and, after the maize, wheat. During the next flood maize is again sown, and is followed by clover, which, after two cuttings, is ploughed up to make way for cotton. Thus, in three years the cultivator gets a crop of cotton, two crops of maize, a crop of wheat, and seven cuttings of clover. In some places cotton is grown every other year, the intermediate crops being wheat, maize, and clover. On the large estate which formed the 'Domains' of Ismail Pasha, and is now managed by a board on behalf of his creditors, the maize cropping is generally omitted, and the land is given two fallows in flood-time in the course of three years. Maize is almost invariably manured. Cotton follows clover and is commonly unmanured. But the Domains administration has found that, by the use of manure, at least 200 lb. can be added to the produce per acre, and the practice of top-dressing is spreading. It may be safely concluded that two-thirds of the Delta—or one and three-quarters million acres—receive manure annually."

DLI.—PAPAIN.

(*Carica Papaya, L.*)

The papaw tree is one of the commonest objects in tropical countries. The fruit cultivated is pear- or almond-shaped, 7–15 in. long, yellow when ripe, and often eaten as a delicacy. The milky juice is well known to render meat tender, and even the leaves are sometimes used for that purpose. This milky juice contains a ferment which has a solvent action upon albuminoid substances, and, like pepsin, curdles milk. It is, however, not so active as pepsin.

Inquiry has been made as to the preparation of papain for commerce in our tropical possessions. The demand is, however, extremely small. A small factory already exists in the island of Montserrat, as recorded in the *Kew Bulletin* (1891, p. 120), the output of which, with an increased demand, would doubtless be much increased.

In a recent article in the *Agricultural Ledger*, 1896, No. 31 (Medical and Chemical Series), issued by the Reporter on Economic Products to the Government of India, the following particulars are given respecting the properties and preparation of papain in India:—

REPORT on Dried Juice of *Carica Papaya* from Gondal, Kathiawar, by Mr. JOHN C. UMNEY, with a Review of the Recent Literature on the Subject, by D. HOOPER, F.C.S.

The *Carica Papaya* tree is so well known and established in India that it seems desirable to set forth what authentic information we

possess on the remarkable properties of the plant. A vast amount has recently been written on the action of the "vegetable pepsin" contained in the juice that abounds in the unripe fruit.

The digestive action of the juice upon meat was probably known in the West Indies at a very early date, and appears to have been communicated to the inhabitants of this country upon the introduction of the tree by the Portuguese, as it has long been the custom in India to render meat tender by rubbing it with the juice of the fruit or by wrapping it in the leaves. In the old "*History of Barbados*" by Griffith Hughes, the author quaintly informs us that "this juice is of so penetrating a nature that if the unripe peeled fruit be boiled with the toughest old salted meat, it quickly makes it soft and tender; and if pigs be fed with the fruit, especially unripe, the thin mucous matter which coats the inside of the intestine is attacked, and, if the food be unchanged, is completely destroyed." The author of the *Makhzan-el-adwiya* (1770) described the tree in his day, and mentions the use of the juice mixed with ginger, for making meat tender.

In 1877, the milky juice of the *Carica* began to attract attention in Europe as a digestive ferment, and Herr Wittmack, of Berlin, in 1878 made a careful examination of its properties and came to the following conclusions respecting it :—

(1) The milky juice of the *Carica Papaya* is (or contains) a ferment which has an extraordinarily energetic action upon nitrogenous substances, and like pepsin curdles milk; (2) this juice differs from pepsin in being active without the addition of free acid, probably it contains a small quantity, and further it operates at a higher temperature (about 60° to 65° C.) and in a shorter time (5 minutes at most); (3) the filtered juice differs chemically from pepsin in that it gives no precipitate on boiling and further that it is precipitated by mercuric chloride, iodine, and all the mineral acids; (4) it resembles pepsin in being precipitated by neutral acetate of lead, and not giving a precipitate with sulphate of copper and perchloride of iron (*Pharm. Journ.*, Nov. 30th 1878).

Dr. Geissler, experimenting in the same direction, found that papain could dissolve 28 times its weight of coagulated albumen, while pepsin dissolved 100 times its own weight.

In 1879 Dr. Theodor Peckolt, of Brazil, made a very complete analysis of the fruit, leaves and seeds of *Carica Papaya*, and he found papayotin in nearly every part of the fresh plant, besides other organic constituents which he separated and estimated.

Dr. Sidney Martin of London was the next to investigate the peculiar principle of the fruit. He showed in 1886 (*Journal of Physiology*) that papain was a proteolytic ferment which acts very similarly to trypsin. Experiments performed with meat fibrin and white of egg showed that slight digestion takes place when the liquid is faintly acid, but none at all when decidedly acid. Digestion takes place actively in neutral or alkaline solutions, and occurs most readily at a temperature between 35° and 40° Fahr. The results of the digestion are peptones, leucine, and tyrosine, and an intermediate globulin-like substance similar to that formed in pancreatic digestion.

In the author's second paper on the same subject the ferment in papaw juice is shown to be associated with an albumose, and to give the following reactions in addition to those previously described by Wurtz :—The solution gives a biuret reaction, and it is precipitated from a neutral solution of sodium, magnesium sulphate or sodium chloride alone, as globulins are. It is soluble in glycerol, and if precipitated

from this solution by alcohol, the filtrate has no proteolytic power. The kind of albumose is one nearly akin to the protalbumose of Kühne and Chittenden, and is called α-phytalbumose. Papaw juice also contains a milk-curdling ferment. The proteids present in papaw juice were found to be as follows :—

(1.) Globulin, resembling serum globulin in its most important properties.

(2.) Albumin.

(3.) β-phytalbumose precipitated almost completely by heat, by saturation with neutral salts, but not by dialysis. It differs from the heteroalbumose of Kühne and Chittenden, by not being precipitated by dialysis, by copper sulphate, or by mercuric chloride.

(4.) α-phytalbumose; soluble in cold or boiling water; not precipitated by saturation with neutral salts, except in an acid solution. This is the vegetable peptone referred to by Vines (*Journ. Physiol*, iii.) as hemialbumose. It differs from the protalbumose of Kühne and Chittenden by its non-precipitation by sodium chloride or by copper sulphate. Both these albumoses give the biuret reaction.

No peptones occur in the juice, but leucine and tyrosine are present. By a series of digestion experiments carried out on each of these proteids by papain in a neutral liquid, it was found that both the globulin and albumen are changed into β-phytalbumose, and that this becomes a peptone-like substance, and forms leucine and tyrosine. The α-phytalbumose becomes a similar peptone-like substance, leucine and tyrosine being formed. This peptone-like substance, resembles the deuteroalbumose of Kühne and Chittenden, except that a solution of it when rendered acid by acetic acid in the presence of sodium chloride, does not become cloudy on warning. No true peptones are formed. Probably digestion in the plant itself is very slow, as much more liquid was used in the experiments than is present in the juice. The albumose forms probably the circulating proteid in the plant.

The leaves of the *Carica* which are said to make meat tender when they are wrapped round it for some time, were discovered by Dr. Greshoff in 1891 to possess an alkaloid named carpaine. Dr. Van Rijn further investigated the alkaloid in 1893, but did not attribute to it any digestive property. The quantity of carpaine separated from the leaves was 0·25 per cent.

On the evidence of the medical, physiological, and chemical experiments made upon *C. Papaya* the active principle has been separated and given the name of papain or papayotin. It is now an article of commerce in Europe for medical purposes ; it has been extensively used in France and Germany, and has been given with good results even to children.

Notwithstanding all the experiments on the vegetable ferment in question, it seems not to have been received with confidence by the medical profession in England, and it has not been introduced into the Pharmacopœias as a substitute for pepsin. The statement often made that papain dissolves 200 times its own weight of fibrin has been contradicted on more than one occasion, and on the other hand it has been shown that papain compares very unfavourably with pepsin when tested with egg albumen under similar conditions.

Regarding this aspect of the case two important papers have recently been written. Dr. S. Rideal of St. George's Hospital, London (*Pharm. Journ.*, August 1894) endeavoured to make out a good case for papain, and attributed unfavourable results to the mistake of supposing that

papain should be tested under the same conditions that hold good for pepsin. Dr. Rideal noticed that papain differs from pepsin in so far as the former acts fairly well in an alkaline solution, while the latter does not, and more particularly that the proportion of fluid to albumen must be much less in the case of papain than is required with pepsin. Mr. D. B. Dott, F.I.C., in the more recent article (*Pharm. Journ.*, March 7, 1896) records some experiments from which he adduced the following conclusions :—

1. That dried papain juice, and the papain prepared from it by purification and precipitation have very little solvent action on albumen, either in alkaline or acid solution.

2. That commercial papain has not nearly the solvent action on albumen which is possessed by pepsin, although it has a disintegrating and special action of its own on animal tissues.

During the course of Mr. Dott's investigations the presence of pepsin was suspected in one of the samples of commercial papain.

The next question that seems desirable to settle is the preparation of commercial papain. If, as it has been suggested, the papain is liable to sophistication with pespin or other subtances, it is impossible to arrive at any satisfactory results with regard to its digestive action. Then, again, the preparation in this country of the juice for the market has not perhaps received a sufficient amount of attention. It should be known that the juice in every case must be collected from *unripe* fruits. As prolonged moisture is deleterious to the ferment, the juice should be dried as soon as possible, and, as heat will destroy its activity, it should be dried at a low temperature. The best method to prepare papain is to collect the juice of the unripe fruit, mix the juice with twice its own volume of rectified spirit, let the mixture stand for a few hours, and then filter off the insoluble matter, and dry it at the ordinary temperature of the atmosphere. After being powdered it should be kept in well-stoppered bottles ready for use.

The following notes on the collection of specimens of papain in India by the Reporter on Economic Products and the results of their examination in London will be read with interest. They show what varied activity the samples may possess if not carefully collected and preserved. If a trade in this substance is to be expected either in India or in Europe we would impress upon all manufacturers to observe carefully the precautions just enumerated. On account of caste difficulties, it would be impossible to introduce pepsin very largely into use in this country, but where a vegetable substance is available every effort should be made to increase our knowledge of it and to understand its action and methods of manufacture and administration.

In May 1894, Mr. M. J. Bharwada, Agricultural Assistant, Gondal, Kathiawar, forwarded to the reporter on economic products three samples of papain obtained from the juice of the fruit of the Papaw tree. These were (1) the precipitate from the milky juice made by adding pure alcohol; (2) the precipitate from the same juice by addition of rectified spirit; and (3) the dried and powdered juice. The specimens were forwarded to Mr. E. M. Holmes, Curator of Museum of the Pharmaceutical Society, who was asked to have them tested and reported upon with reference to their comparative value as substitute for pepsine. Mr. Ernest J. Easters, F.I.C., was kind enough to examine them, but he stated that they arrived in such a bad condition that not one of the samples was found to have any disturbing action on milk; the curdling of milk is a very characteristic property of the ferment of papaya juice.

Subsequently Mr. Bharwada made a second collection of products of *Carica* for examination, consisting of 12 ounces of the dried powder obtained from the juice, and a small quantity of papain prepared with alcohol. These were forwarded to the Curator of the Pharmaceutical Society who kindly placed them in the hands of Mr. J. C. Umney, F.C.S., for investigation. From Mr. Umney's experiments it would seem that a highly active ferment might be manufactured from the crude juice by repeated purification by alcohol. The attention of all those who are interested in the subject should be drawn to this method of preparation.

REPORT on a Sample of Powder of the Dried Juice of *Carica Papaya*, from Gondal, Kathiawar.

The sample was in coarse powder, of a greyish yellow colour, and possessed a faint, somewhat unpleasant odour.

Ten grammes dissolved in water and precipitated by absolute alcohol yielded 4·2 grammes of crude Papain, after drying at ordinary temperature over sulphuric acid.

The digestive power of this purified product was then tested on moist egg albumen, at a temperature of 38° — 39° C. in neutral acid and alkaline solutions using the following proportions :—

10	grammes of egg albumen.	
0·1	„	papain.
30	c.c.	Distilled water.
0·1	grammes	Bicarbonate of Sodium for Alkaline.
1	c.c.	Hydrochloric acid B.P. for acid

Digested in 30 minutes.

Neutral - -	12·03 per cent.
Alkaline - -	13·72 „
Acid - -	12·07 „

These results indicate that the digestive activity in neutral and acid solutions is almost identical, whilst in alkaline solutions it is somewhat greater.

These results were compared with a well-known commercial Papain, proceeding on exactly similar lines, the results obtained being as under :—

Digested in 30 minutes.

Neutral - - -	17·81.
Alkaline - - -	17·483.
Acid - - -	25·0.

The greater activity in acid than neutral and alkaline solution is the principal point of difference between this brand of Papain and other commercial samples of papains and concentrated papaw juice, and has been the subject of controversy between different experimenters. The presence of another ferment, such as pepsin, active in acid solution, appears to be indicated.

I have examined several samples of commercial papains, and the results have been similar in every respect, and it may be noted that they accord well with those obtained by Dott (*P. J.*, 3rd Series, xxiv., 758, 759).

There is no doubt that by repeated precipitation by alcohol a highly active digestive product might be obtained from this crude concentrated papaw juice valuable for use under those circumstances where pepsin is unavailable.

JOHN C. UMNEY.

DLII.—MISCELLANEOUS NOTES.

Mr. Gwynne Vaughan, who had for the previous two years been working in the Jodrell Laboratory of the Royal Gardens, has been appointed an Assistant to the Regius Professor of Botany in the University of Glasgow.

Mr. W. H. Lang, Lecturer in Botany, Queen Margaret College, has been engaged during last year at the Jodrell Laboratory of the Royal Gardens in an investigation into the relation existing between variability in the fern plant and apogamy in the prothallus. This led to the interesting discovery of the occasional occurrence of sporangia on the latter. The results were communicated to the Royal Society, and published in the *Proceedings* for November last (Vol. 60, pp. 250–260).

West India Commission.—In consequence of the depressed condition of the West India Colonies a Royal Commission has recently been appointed, as published in the following announcement:—

The Queen has been pleased to appoint General Sir Henry Wylie Norman, G.C.B., G.C.M.G., C.I.E. (Chairman); Sir Edward Grey, Bart., M.P., and Sir David Barbour, K.C.S.I., to be Commissioners to inquire into the conditions and prospects of the West India sugar-growing Colonies, and Mr. Sidney Olivier, B.A., to be their Secretary; Daniel Morris, Esq., D.Sc., C.M.G., Assistant Director of the Royal Gardens, Kew, will accompany the Commission as Expert Adviser in botanical and agricultural questions.

The terms of the reference to the Commission were as follows:—

"To inquire into the condition and prospects of the colonies of Jamaica, British Guiana, Trinidad and Tobago, Barbados, Grenada, St. Vincent, St. Lucia, and the Leeward Islands, and of the sugar industry in those colonies, and of the labouring classes there, and especially whether the sugar industry is in danger of extinction in such colonies or any of them, and what is the amount of capital at present invested in it; whether the present depression is due wholly or in part to mismanagement, imperfect processes, absentee ownership, or any other causes independently of the competition of sugar produced under the bounty system, and whether the removal of such causes would be a sufficient remedy for the said depression. Whether in the event of the abandonment of sugar cultivation there are other industries which could be prosecuted with success, and which would find adequate employment for the population; and what would be the probable result of a complete failure of the sugar industry on the condition of the labouring classes, both West Indian and East Indian, and on the revenue of those Colonies, and whether any deficiency of revenue caused by the extinction of the sugar industry could be met by economies in the administration without imperial aid."

Botanical Magazine for January.—The plants figured are:—*Aristolochia clypeata, Cynoglossum nervosum, Berkheya Adlami, Croton Eluteria*, and *Bignonia buccinatoria*. The figure of the last-mentioned was prepared from a specimen received from the Commendatore Hanbury,

and of the others from plants in cultivation at Kew. The *Aristolochia*, native of New Grenada, is allied to *A. Duchartrei*, but the flowers are much larger. The Kew plants were received from Messrs. F. Sander & Co., of St. Alban's, in 1892. The *Cynoglossum*, the largest flowered of the Himalayan species, was raised from seeds sent to Kew by Mr. J. F. Duthie, in 1894. *Berkheya Adlami* is a new species from the Transvaal. R. W. Adlam, Esq., of Johannesberg, forwarded seeds to Kew in 1895, and these produced plants which flowered in June 1896. The *Croton* is of considerable commercial interest as the source of "Cascarilla Bark." The species, native of the Bahamas, was reintroduced into Europe in 1887, when three plants were sent to Kew by F. B. Taylor, Esq., of the Bahamas. *Bignonia buccinatoria*, from Central Mexico, has large, handsome flowers. It is figured in the Botanical Register as *B. Cherere.*

Botanical Magazine for February.—*Myrmecodia Antoinii, Maxillaria sanderiana, Ligustrum coriaceum, Paracaryum heliocarpum,* and *Hemipilia amethystina* are figured. The *Myrmecodia*, native of the islands of Torres Straits, is a singular rubiaceous plant, which has its stem very much enlarged at the base (see *Kew Bulletin*, 1897, p. 86). The flowers are insignificant. The plant figured was presented to Kew by Professor Stewart, F.R.S., and flowered in a stove in January 1896. *Maxillaria sanderiana* is probably the finest species of the genus. It is a native of Ecuador, where it grows at an altitude of 4,000 feet. The Japanese *Ligustrum* was drawn from a plant sent to Kew by Mr. Rashleigh, of Menabilly, in 1889. The *Paracaryum* is a West Himalayan species, which flowered in the Herbaceous Ground in May of last year, seeds having been sent to Kew by J. F. Duthie, Esq., F.L.S., Director of the Botanical Department of Northern India. The *Hemipilia* is a new species from Burma, and was sent to Kew by Messrs. W. L. Lewis & Co., of Southgate.

Supplement to the Index Kewensis.—It is satisfactory to be able to announce that M. Th. Durand and Mr. B. Daydon Jackson have made arrangements for printing their 10 years' supplement to the *Index Kewensis*, which will bring the work down to the end of the year 1895. It is hoped it may be issued during the present year.

Bambuseæ of British India.—The publication of Mr. Gamble's exhaustive monograph of the Bamboos of British India was announced in a previous number of the *Bulletin*. Sir Joseph Hooker has used it as the basis of his own revision of the Group in the Flora of British India. He has prefaced this with the following interesting note :—

"The following account of the Indian *Bambuseæ* is drawn up, almost verbatim, from Mr. Gamble's 'Bamboos of British India,' which forms part of vol. vii. of Dr. King's *Annals of the Royal Botanic Gardens of Calcutta*, and of which Dr. King favoured me with a copy in advance, together with his and Mr. Gamble's permission to reproduce its contents in a form suited to the 'Flora of British India.' In doing this I have been obliged to curtail the descriptions. And in order to preserve the arrangement of matter adopted in this work, I have had to substitute

for the Keys to the species employed by Mr. Gamble, specific characters selected according to my judgment from his detailed descriptions; and in a few cases to substitute synonymous technical terms for those he has used. I have added nothing; for it is obvious that a botanist of Mr. Gamble's ability and wide experience of so many of the Indian Bamboos in their native forests, having access also to the unrivalled collections in the Herbarium of the Calcutta Gardens, should have exhausted the subject in so far as materials were available. It must not be supposed that this work supersedes his 'Bamboos of British India,' which is indispensable to the student of the tribe, by reason of its fuller descriptions, and admirable plates and analyses. My cordial thanks are directly due to Dr. King and Mr. Gamble for this generous contribution the 'Flora of British India,' and indirectly for the authentically named collection of specimens corresponding to Mr. Gamble's descriptions, which has been presented by the Government of India to the Herbarium of the Royal Gardens, Kew.

"Since the above was written, Mr. Freeman Mitford's *The Bamboo Garden* has appeared, a work replete with valuable observations upon the habit, mode of growth, and other characters of the hardy species of Bamboo (including 5 Indian) cultivated by him. In it is pointed out (see *Arundinaria Simoni*, p. 60) for the first time the true characters of the two types of sheath and blade that occur in *Bambuseæ*, and which do not obtain, so far as I know, in any other tribe of grasses. In a communication which Mr. Mitford has been good enough to make to me on this subject he has formulated his views as follows, and has kindly allowed me to introduce them here.

"The sheath is an organ playing so important a part in the life of the bamboo that it deserves something more than a cursory notice. In the grasses generally the sheath is regarded by botanists as taking the place of the petiole of the leaf. It happens, however, that the leaves of most bamboos—indeed of all the hardy bamboos—have a distinct continuation of the midrib of the leaf attaching it to the sheath and articulated, which continuation might perhaps be correctly termed a petiolule. The bamboos, as it appears, bear sheaths of two types. There is first of all the series of sheaths which, borne one on each node and wrapped tightly round the culm or branch, as the case may be, protect it during growth. This form of sheath is divided or split transversely into two members, the ligule and the limbus or blade, the latter being what I would term a pseudophyll, or false leaf, sessile, lacking both midrib and petiole, varying in size in the different species, but always the first part to wither and disappear. In some bamboos—those of the *Phyllostachys* group—this sheath falls away as soon as branching takes place; in others, of the *Arundinaria* group, it remains, and having guarded the tender growth of the parent culm or branch it springs aside with the young branches or branchlets, devoting the remainder of its life to their protection until they can stand alone.

"Then there is the second form of sheath bearing a true leaf with petiole and midrib. This is the form assumed by the two, three, or four sheaths at the top of each culm branch and branchlet above the topmost node where branching ends. This true leaf is persistent upon the sheath. The ligule is present, as in the first type, but the deciduous pseudophyll is replaced by an evergreen leaf.

"An interesting question arises as to whether there is any transition stage between the two types of blade, or whether the change is always sudden. I think that in many Bamboos I can trace such a transition stage; that is to say, that each successive pseudophyll on the stem

becomes more and more like a true leaf, something of the nature of an arrested midrib being perceptible in the pseudophylls which are found near the top of the culm, though it is not until the last branching node has been passed that the true leaf-bearing sheaths occur. The principle remains inviolate (throughout the hardy species at any rate), and the distinction between the two classes of sheaths is absolutely maintained." —A. B. F. M.

"I would remark in conclusion that Mr. Mitford's observations, extending to the nervation of the leaves of Bamboos, lead him to the conclusion that of those cultivated by him in the open air in the middle of England, the truly hardy only have tessellated leaves; the tender, such as *Arundinaria Falconeri* and *falcata*, having very inconspicuous transverse nervules, or none."—J. D. H.

Insular Floras.—Amongst recent additions to the library bearing upon this subject the following are worthy of note. The *Flore de l'Ile de la Réunion*, by Dr. E. Jacob de Cordemoy, contains an account of the Phanerogams, Vascular Cryptogams, and Muscineæ of the island. The volume is prefaced by a short description of the island and its explorers. The cryptogams (excluding fungi) number 793, while the phanerogams amount to 1,156, of which 372 are monocotyledons. The order with most representatives is Orchideæ, with 172 species, including many curious novelties described by Mons. Ch. Frappier, specimens of some of which have been presented to the Herbarium by Dr. Cordemoy. Next to the Orchideæ in point of numbers come the Gramineæ with 94 species.

L'Archipel de la Nouvelle-Calédonie, by Dr. Aug. Bernard, contains a complete account of the islands of this group, including two chapters devoted to a general account of the vegetation, which is said to comprise 2,026 phanerogams and 965 cryptogams and to be the richest flora amongst those of the Pacific Archipelagos.

Flora de Juan Fernandez, by Dr. F. Johow, contains in addition to an enumeration of the plants, an account of the geographical and geological conditions of the archipelago.

New Guinea Plants.—Sir W. MacGregor, K.C.M.G., has presented a collection of plants made on Mount Scratchley, by Mr. A. Guilianetti, at altitudes varying from 4,000 to 13,000 feet. At the higher altitudes two species of *Vaccinium* and several of *Rhododendron* were met with. Eight undescribed species of grasses were collected. At lower elevations *Polygonum chinense*, L. and *Cordyline terminalis*, Kunth, were found, as well as *Solanum torvum*, Swtz., a species which has proved troublesome to agriculturalists in Assam (see *Kew Bulletin*, 1896, p. 63). A second collection, presented by Messrs. Veitch, was made by Mr. Burke between the coast and a height of 4,000 ft. on the Owen Stanley range in the south-east peninsula. The plants in this collection are of a tropical type and include a curious new species of *Begonia*.

Vanilla cultivation in the Seychelles.—In continuation of information that has already appeared in the *Kew Bulletin*, 1892, 111 (with plate), the following particulars have been communicated to this establishment by the Secretary of State for the Colonies:—

ADMINISTRATOR OF SEYCHELLES to COLONIAL OFFICE.

Government House, Seychelles,
September 25, 1896.

SIR,

I HAVE the honour to report that the result of the Vanilla crop for this year is most satisfactory. The crop up to the present (it is not quite all gathered) is returned at 40,000 lbs., and has realised over half a million of rupees.

The prices have been exceptionally high owing, I am told, to a reduced exportation of Vanilla from Mexico. Seychelles Vanilla is now well and favourably known both in the London and Paris markets.

I have, &c.,
(Signed) H. COCKBURN STEWART,
Administrator.

To the Right Hon.
JOSEPH CHAMBERLAIN, M.P.,
&c. &c.

EXTRACT from Colonial Reports. Annual. No. 182. Seychelles. Annual Report for 1895, p. 9.

Next to cocoanut oil, Vanilla is our most important produce, and in a good year the crop gives a return of about Rs. 400,000. Unfortunately, vanilla is a most capricious plant, and, whereas we may have a good crop for two consecutive years, we may have also three, or even four, years without any crop at all.

Botanic Station, Old Calabar.—The following is an extract from a letter received from Mr. John Henry Holland, whose appointment as Assistant Curator of the Botanic Station in the Niger Coast Protectorate was announced in the *Kew Bulletin*, 1896, p. 147.

"The gardens are well situated, on rising ground, covering altogether about 45 acres. This includes a large area planted with coffee, a small proportion with cacao, whilst experimental grounds and nursery occupy the remaining part. There is, I can assure you, plenty to do.

"The quarters are good, situated conveniently in the gardens, on a hill about 160 feet high. We have not a very extensive view of the surrounding country, being partly enclosed with dense bush. We can, however, see Duke Town at the foot of the hill, and catch a glimpse of the river, with an occasional sight of a steamer passing by to the anchorage."

Spanish Chestnut.—The cultivation of the Spanish chestnut has now got beyond the experimental stage in Bashahr. Some of the trees planted 15 years ago are now 30 feet high and four feet in girth.

Fresh plants have been put out and others distributed to villagers. The present yield of nuts amounts to about 10 maunds. (*Progress Report of Forest Administration in the Punjab* for 1894–5, p. 14).

Kei-Apple as a Hedge Plant.—This shrubby South African plant (*Aberia Caffra*, Harv. & Sond.) a member of the Annatto Order (Bixineæ) is armed with long spines and makes excellent hedges. It is evergreen and bears fruits like small yellowish apples. When fresh they are acid and used as a pickle; when ripe they make a good jam. The *Waikato Times* of New Zealand, recommends the Kei-apple as a hedge plant in the following terms:—

"One is always hearing complaints nowadays of the paucity of good plants suitable for hedge purposes. This harbours the wheat rust or the leech, but dies out in patches, while another would be admirable were the cows not so fond of it. This being so, the thanks of the community are due to Mr. A. Tempest, of Parnell, for his enterprise in introducing and propagating the 'Kei Apple.' It was Sir George Grey, I believe, who first mentioned the shrub, which grows wild upon the Karoo, or sandy plains of South Africa, and it certainly seems a perfect hedge plant. It is a sturdy, stocky, short-jointed grower, an evergreen, and with thorns which grow to six inches long and over, and a 'perfect terror to evil doers,' be they beasts or human beings. As an added advantage, the female plants (they are of both sexes) fruit heavily, bearing in great quantity yellow plum-shaped fruit, the size of a greengage, which are both pleasant eating and make an exquisite jam. Orchardists would do well to bear this shrub in mind when planting."

To this the following note is added in the *Agricultural Journal* of the Cape of Good Hope:—

"It will be noticed that a wrong part of the country is stated to be the native habitat of this plant, but all the good qualities as a hedge plant are perfectly true. In some old book of travels in South Africa it is stated that on the eastern coast there were 'wild apricots'; were these Kei apples? Few people like to eat the fruit raw, but the jam is first rate. A proportion of Kei apple with tomato would make a good jam."

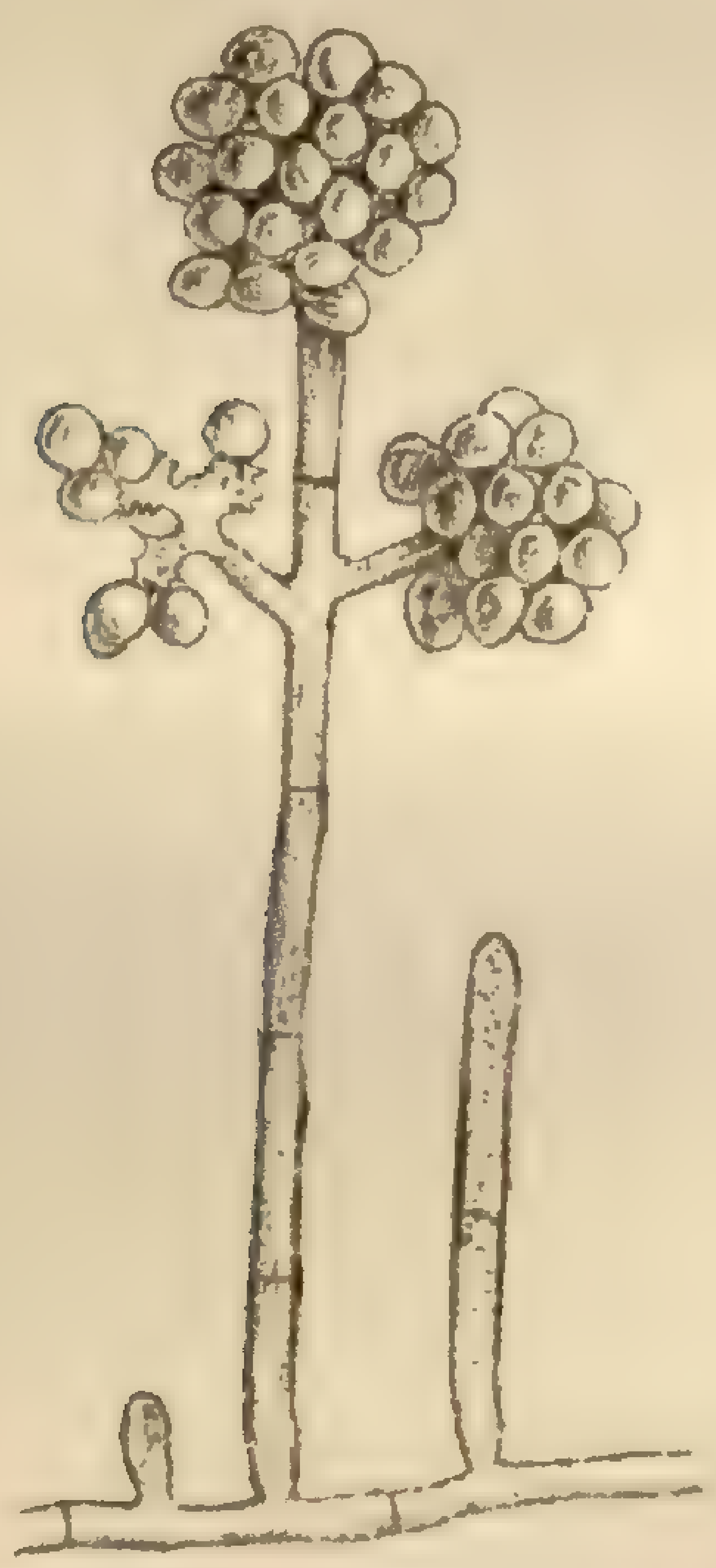
Dr. J. R. Roth.—In consequence of a misreading of the name of the collector of a collection of plants made in Abyssinia and presented to Kew by the Honourable East India Company, and the consequent writing of this name—Rohr,—on all the labels accompanying the plants, some confusion has arisen. Several plants supposed to be named after the collector bear the spurious name. Dr. J. R. Roth was the real collector. He was attached as Naturalist to a mission sent by the British Government, in 1841, to Sáhela Selássie, the King of Shoa, in Southern Abyssinia. Mr. W. Cornwallis Harris, the author of the almost forgotten "Highlands of Æthiopia," was at the head of the mission, and in his book he speaks very highly of Dr. Roth, who contributed the appendix on the natural history of the country. Dr. Roth had previously travelled in Egypt, Arabia, and Syria, with Drs. Schubert and Erdl. Subsequently he became Professor of Natural History at Munich, and in 1858 he made another journey to the East, but soon succumbed to fever on the route from Beyruth to Mount Hermon.

Aseroë rubra, La Bill.

Clavaria kewensis, Mass.

Chitonia rubriceps, C&M.

Flammula purpurata, C. & M.



Botrytis corolligena, C.&M. × 200.

Wyman & Sons ... 9186 9·91

ROYAL GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 124.] APRIL. [1897.

DLIII.—MYCOLOGIC FLORA OF THE ROYAL GARDENS, KEW.

The area of the Royal Gardens is a little more than 250 acres. If some adjacent pieces of Royal property are thrown in the total is some 300 acres, or nearly half a square mile. Taken with the Old Deer Park to the south, the whole space is singularly isolated, bounded as it is on three sides by the bend of the river sweeping round from Kew to Richmond, and on the other by the high road between these two places.

Of the Royal Gardens themselves some 100 acres is little disturbed by any kind of cultivation, and it has certainly remained so for at least a century and a half. Some portions may never possibly have been subjected to cultivation at all. It is not surprising therefore that in the background of horticultural treatment there still subsists a wild fauna and flora of no inconsiderable dimensions. This, as opportunity offers, it is proposed to work out and catalogue from time to time. Mr. G. Nicholson, A.L.S., the present Curator, enumerated the flowering plants occurring spontaneously in the *Journal of Botany* for 1875. A striking peculiarity of this list "is the very small number of naturalised exotics."

In the case of Fungi, as will be seen from the following enumeration by Mr. G. Massee, F.L.S., Principal Assistant in the Herbarium, the case is very different.

The following enumeration of 337 genera and 1340 species illustrates the richness of the Mycologic Flora of the Royal Gardens, which far surpasses in point of numbers, as also in the variety of rare and interesting species, any other record for an equal area.

This is only perhaps what would be expected, when the large annual influx of plants to Kew from all quarters of the globe is taken into consideration. By this means microscopic fungi, parasitic or saprophytic on plants, are introduced in a living condition on the various hosts, whereas the higher forms belonging to the Agaricineæ and the Gastromycetes are usually introduced along with soil, or frequently on the trunks of tree-ferns, either in the form of spores, or in an undeveloped condition.

It is worthy of note that the *Polyporeæ* and *Thelephoreæ*, so abundant in tropical regions, are absent from the list as introduced species.

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As illustrative of the exotic element may be mentioned *Hiatula Wynniæ*, Berk. and Broome, first described (*Ann. Mag. Nat. Hist.*, 1879, p. 206), from specimens found in a stove in the Gardens; this species has recently been received from the neighbourhood of Brisbane, where it is not uncommon, and said to be luminous, emitting a pale green light. It is figured by Cooke (*Illustr. Brit. Fung.*, pl. 688). *Flammula purpurata*, Cke. & Mass., a very beautiful fungus, was established (*Grev.*, xviii., 73) from specimens growing on the trunk of a tree-fern in one of the fern-houses, and has since been received from New Zealand, its undoubted home. *Aseröe rubra*, La Bill., the most beautiful of the many quaint forms belonging to the Gasteromycetes, a native of Queensland, also occurred in a stove, some time previous to the year 1867; the specimens are at present in the Herbarium. The genus *Chitonia*, including only four known species, is represented by *C. rubriceps*, Cke. & Mass. (*Grev.*, xv., 57), found on soil in the Aroid House, but although a typical member of an exotic genus, no clue as to its native habitat has yet been obtained.

Coming to microscopic forms, we find that the list contains a still greater per-centage of introduced species, *i.e*, species new to the British list, and growing on exotic plants. The genus *Phoma* heads the list with 107 species, of which above three-fourths have been met with only at Kew, so far as the British Isles are concerned, and of these above thirty were first established from Kew material by Dr. Cooke, who paid special attention to this genus.

Not a single example, however, of a parasitic fungus, that has proved to be destructive to plants, has been introduced to Europe through Kew.

The indigenous species of fungi belonging to the Agaricineæ—probably due to a great extent to the absence of cattle in the grounds—are fewer than would be expected, with the following notable exceptions. In the genus *Russula* fifty-two species have been observed during the last ten years, out of a total of sixty-one British species. The large size and brilliant colouring of most species belonging to this genus render them very conspicuous objects in the Arboretum during late summer and early autumn. Another genus containing species of sufficient size and brilliancy of colour to attract popular attention is *Boletus*, which numbers twenty-six species.

A fairly good collection of specimens of fungi, along with models and drawings, are exhibited in No. 2 Museum.

A word of thanks is due to the members of the Garden staff, interested in Mycology, for the discovery of numerous species, which, but for their zeal, would not have appeared in the present list.

The host-plant, or matrix, on which each fungus occurred, has been given, and also the locality for the larger species that are likely to occur again. Finally, notes have been added, indicating the edible and poisonous species of the Agaricineæ, also the parasitic species that are known to be destructive to plants.

The species of Myxogastres occurring at Kew are given in an Appendix at the end.

Explanation of the abbreviations used :—

A. Arboretum ;
B. Botanic Garden ;
P. Palace and Herbarium Grounds ;
Q. Queen's Cottage Grounds.

BASIDIOMYCETES.

Hymenomycetes.

Agaricineæ.

Amanita, *Fries.*

A. virosa, *Fries.*
Among grass. Poisonous. A.

A. Mappa, *Batsch.*
Under beeches, A.

A. phalloides, *Fries.*
A dangerous species. It has been proved that a large percentage of the accidents caused by fungus poisoning, both in this country and on the Continent, have been caused by this species. A figure is exhibited in No. 2 Museum.

A. muscaria, *L.*
A large, showy fungus, the cap when expanded often as large as a dinner-plate, brilliant crimson with white spots. Very poisonous. Q.

A. rubescens, *Pers.*
Edible, flavour mild; the flesh of cap and stem turns red when broken. Care must be taken not to confound this species with *Amanita pantherina*, which is poisonous. A., Q.

A. pantherina, *DC.*
Under trees. Poisonous. The flesh remains perfectly white when broken. A.

A. spissa, *Fries.*
Under beeches. A.

Amanitopsis, *Karsten.*

A. vaginata, *Karsten.*
Edible, flavour very delicate. Colour of cap variable, grey, buff, orange, or white. A., Q.

Lepiota, *Fries.*

L. procera, *Scop.*
Edible. Popularly known as the parasol mushroom, on account of its shape. Sometimes very large, a specimen from the Arboretum had a stem 16 inches long, and pileus 11 inches across. A., B., Q.

L. rachodes, *Vitt.*
Edible; similar in flavour and appearance to *L. procera*. Q.
Var. **puellaris**, *Fries.* A.

L. excoriata, *Schaeff.*
Edible. B.

L. leucothites, *Vitt.*
Edible. B.

L. Badhami, *Berk. & Broome.*
Under *Sequoia sempervirens*. A.

L. emplastra, *Cke. & Mass.*
Under *Cedrus Libani*. This species was founded on specimens collected in the gardens and is described (*Grev.*, xviii., 51). A figure is given in *Illustr. Brit. Fungi*, pl. 1164. A.

L. clypeolaria, *Bull.* A.

L. cristata, *Fries.* A.

L. cepæstipes, *Sow.*
On soil in conservatory.
Var. **cretaceus**, *Bull.*
In a stove.

L. licmophora, *Berk. & Broome.*
On soil in Palm house. A very elegant fungus, a native of Ceylon, established by Berkeley and Broome (*Journ. Linn. Soc., Bot.* xi., 500); figured in Cooke's *Illustr. Brit. Fungi*, pl. 1179.

L. carcharia, *Pers.*
Under *Pinus sylvestris*. A.

L. granulosa, *Batsch.*
Under *Pinus sylvestris*. A.

L. martialis, *Cke. & Mass.*
On palm stem in Palm house.

L. ianthina, *Cke.*
On soil in a stove.

L. felina, *Pers.*
On the ground. A.

Armillaria, *Fries.*

A. mellea, *Vahl.*

On the ground, round roots of trees. A destructive parasite, destroying trees, especially attacking those that have been injured near the base of the trunk. When the disease is once established, the cord-like mycelium or spawn spreads in the ground until it comes in contact with the roots of another tree, which is attacked in turn. Edible, but lacking flavour. A., B., Q.

A. Citri, *Inzeng.*

On stump. B.

Tricholoma, *Fries.*

T. portentosum, *Fries.*

Under trees. A.

T. flavo-brunneum, *Fries.*

Under trees. Q.

T. albo-brunneum, *Pers.*

Under trees. A.

T. rutilans, *Schaeff.*

On stumps. B.

T. imbricatum, *Fries.*

Under trees. A.

T. terreum, *Fries.*

Under trees. Q.

T. saponaceum, *Fries.*

On the ground. A. and B.

T. sulfureum, *Bull.*

On the ground. A., P.

T. ionides, *Bull.*

Among grass. A.

T. carneum, *Bull.*

Among grass. A.

T. album, *Schaeff.*

Among grass under trees. A.,Q.

T. duracinum, *Cke.*

Under beeches. First observed at Kew. Described (*Grev.*, xii., 41); figured (*Illustr. Brit. Fung.*, pl. 640). A.

T. personatum, *Fries.*

Among grass. Edible. One of the few species which, in addition to the common mushroom, may sometimes be seen offered for sale under the name of "Blewitts" or "Blue-caps." A., B.

T. nudum, *Fries.*

Among grass. Edible; preferred by some people to *T. personatum*, which it much resembles. A.

Var. **major**, *Cke.* A.

T. melaleucum, *Fries.*

On the naked ground. A., B.

Var. **porphyroleucum**, *Fries.* B.

T. brevipes, *Bull.*

On the ground. A.

T. humile, *Fries.*

On heaps of dead leaves. A.

T. sordidum, *Fries.*

On heaps of dead leaves. A.

T. Pes-capræ, *Schaeff.*

On the ground under beeches. A.

T. circumtectum, *Cke. & Mass.*

Under beeches. First found in the gardens in 1886, and afterwards in abundance in Yorkshire (*Cke.*, *Hdbk.*, ed. ii., 382; *Illustr. Brit. Fung.*, pl. 1182). A.

T. tenuiceps, *Cke. & Mass.*

Under trees. (*Cke. Hdbk.*, ed. ii., 398; *Illustr. Brit. Fung.*, pl. 1166.) A.

T. Russula, *Schaeff.*

Among grass. A.

T. subpulverulentum, *Fries.*

Among grass. A.

T. cuneifolium, *Fries.*

Under trees. P.

T. grammopodium, *Fries.*

Among short grass. A., Q.

Clitocybe, *Fries.*

C. nebularis, *Batsch.*

Under trees among leaves. Edible; a large fleshy fungus having an excellent flavour, fairly abundant, and not easily

Clitocybe—*cont.*

mistaken for any other species when once understood. Q.

C. clavipes, *Fries.*
Under trees. A.

C. odorus, *Fries.*
On the ground. A., Q.

C. cerussatus, *Fries.*
Under trees. A.

C. phyllophilus, *Fries.*
Among dead leaves. A., Q.

C. pithyophilus, *Fries.*
Among dead leaves. A.

C. tornatus, *Fries.*
Under trees. Q.

C. candicans, *Fries.*
Among leaves. A., P.

C. fumosus, *Pers.*
Among grass by paths. A.

C. infundibuliformis, *Schaeff.*
Among grass. Q.

C. inversus, *Scop.*
Under cedars. P.

C. flaccidus, *Fries.*
Under trees. P.

C. Tuba, *Fries.*
Among grass. Q.

C. cyathiformis, *Fries.*
Under trees. A., B.

C. pruinosus, *Fries.*
Among grass. A.

C. brumalis, *Fries.*
Under trees. Q.

C. metachrous, *Fries.*
Under trees. A., Q.

C. fragrans, *Sow.*
Among grass. A., P.

Laccaria, *Berk. & Broome.*

L. laccata, *Berk. & Broome.*
Among grass under trees. A.

Collybia, *Fries.*

C. radicata, *Fries.*
Among grass. A., B.

C. platyphylla, *Fries.*
On the ground under trees.

Collybia—*cont.*

C. fusipes, *Bull.*
Among grass in open places. Edible. A.

C. maculata, *Alb. & Schw.*
Among grass. A.

C. distorta, *Fries.*
On heaps of dead leaves. A.

C. butyracea, *Bull.*
On the ground under trees. A., Q.

C. stipitaria, *Fries.*
On twigs lying on the ground. B.

C. confluens, *Pers.*
On the ground. A.

C. conigena, *Pers.*
On fallen cones of *Pinus sylvestris.* A.

C. cirrhata, *Schum.*
On the ground among grass and moss. A., Q.

C. tuberosa, *Bull.*
On decaying *Russula nigricans.* A., Q.

C. nitellina, *Fries.*
On the ground. A.

C. esculenta, *Jacq.*
On the ground under trees. A.

C. tenacella, *Pers.*
Under pines. A.

C. dryophila, *Bull.*
On the ground under trees. A., Q.

C. aquosa, *Bull.*
Among grass under trees. A.

C. ocellata, *Fries.*
Among grass. A.

C. muscigena, *Schum.*
On the ground among moss and grass. Q.

C. rancida, *Fries.*
On stumps. A.

C. ambusta, *Fries.*
On burnt ground. A.

C. protracta, *Fries.*
Among leaves lying on the ground. A.

Collybia—*cont.*

C. prolixa, *Fries.*
On the ground near stumps. Q.

Mycena, *Fries.*

M. pelianthina, *Fries.*
Among leaves under trees. A.

M. pura, *Pers.*
On the ground under trees. A., Q.

M. lineata, *Bull.*
Among grass. A.

M. luteo-alba, *Bull.*
Among short grass. A.

M. rugosa. *Fries.*
On stumps. A.

M. galericulata, *Scop.*
On stumps. A., Q.

Var. **calopus**, *Fries.*
On stumps. A.

M. polygramma, *Bull.*
On stumps. A., B.

M. dissiliens, *Fries.*
Among grass and on a stump. A.

M. atro-cyanea, *Batsch.*
Among grass under trees. Q.

M. alcalina, *Fries.*
On the ground and on stumps and twigs. Q.

M. ammoniaca, *Fries.*
Among grass. A.

M. metata, *Fries.*
Among short grass. A.

M. vitrea, *Fries.*
Among grass. A.

M. vitilis, *Fries.*
Among grass. A.

M. tenella, *Fries.*
Among short grass. A., P.

M. acicula, *Schaeff.*
On leaves and small twigs lying on the ground. B.

M. sanguinolenta, *Alb. & Schw.*
Among dead leaves. A.

M. galopoda, *Pers.*
On the ground among leaves. A., Q

Mycena—*cont.*

M. leucogala, *Cke.*
On a stump. A peculiar little fungus of a dark purple brown colour; when the stem is broken a white milky looking fluid exudes in drops. (*Grev.* xi., 41; *Illustr. Brit. Fung.*, pl. 653.) A.

M. epipterygia, *Scop.*
Among leaves and on branches lying on the ground. A., Q.

M. pelliculosa, *Fries.*
Among grass. A.

M. vulgare, *Pers.*
On twigs and on leaves on the ground. A.

M. consimile, *Cke.*
Among leaves. (*Grev.* xix., 41; *Illustr. Brit. Fung.*, pl. 1186.) Q.

M. citrinella, *Pers.*
Among dead leaves. A.

M. rorida, *Fries.*
Among leaves and moss, and on twigs. A.

M. tenerrima, *Berk.*
On twigs and herbaceous stems. B.

M. discopoda, *Pers.*
On branches, &c. A.

M. corticola, *Schum.*
On bark of trees. A.

M. hiemale, *Osbeck.*
On bark of trees. A.

Omphalia, *Fries.*

O. hydrogramma, *Fries.*
Among leaves under trees. A.

O. pyxidata, *Bull.*
On banks. A.

O. rustica, *Pers.*
On banks. A.

O. hepatica, *Batsch.*
On the ground among moss, &c. P.

O. muralis, *Sow.*
On dry banks. A.

O. infumata, *Berk & Broome.*
Among grass and moss. A.

Omphalia—*cont.*

O. umbellifera, *L.*
On banks. A.

O. retosta, *Fries.*
Dry places on the ground. P.

O. griseo-pallida, *Desm.*
Among dry grass. A., P.

O. Campanella, *Batsch.*
Among moss and short grass. A.

O. Fibula, *Bull.*
Among short grass. P.

Var. **Swartzii**, *Fries.*
Among grass. A.

Pleurotus, *Fries.*

P. corticatus, *Fries.*
On trunks, A.

P. ulmarius, *Bull.*
On elm trunks. A., P.

P. ostreatus, *Jacq.*
On fallen trunks. Many people are prejudiced against fungi growing on wood or stumps, considering that all such are poisonous; this is true of some species, nevertheless *Pleurotus ostreatus*, the "oyster fungus," so called on account of its cap resembling an oyster-shell in shape, always grows on wood, yet it is universally acknowledged as one of the best and safest of edible fungi. Q.

Var. **euosmus**, *Fries.*
On trunks. A.

Var. **columbinus**, *Bres.*
On stumps, Q.

P. salignus, *Fries.*
On willow trunks by the lake. A.

P. limpidus, *Fries.*
On rotten wood lying on the ground. A.

P. tremulus, *Schaeff.*
On rotten wood. A.

P. acerinus, *Fries.*
On fallen trunks. Q.

P. acerosus, *Fries.*
On gravel paths and on lawns. A.

Pleurotus—*cont.*

P. algidus, *Fries.*
On wood.

P. septicus, *Fries.*
On twigs and decaying *Polyporus.*

P. applicatus, *Batsch.*
On rotten wood. A.

P. hypnophilus, *Pers.*
On moss. A., P.

P. chioneus, *Pers.*
On rotten wood. A.

P. sapidus, *Kalchbr.*
On elm trunks. Edible. A.

Hygrophorus, *Fries.*

H. eburneus, *Bull.*
Among grass under trees. Q.

H. aureus, *Arrh.*
Among grass. A.

H. hypothejus, *Fries.*
Among grass. A.

H. mesotephrus, *Berk. & Broome.*
Among grass. A.

H. livido-albus, *Berk. & Broome.*
Among grass. A.

H. pratensis, *Pers.*
Among grass in open places. Edible. A.

H. virgineus, *Wulf.*
Open grassy places. A.

Var. **roseipes**, *Mass.*
Among grass. A.

H. niveus, *Scop.*
Among short grass. A.

H. fornicatus, *Fries.*
Among grass. Q.

H. distans, *Berk.*
Among grass. Q.

H. Clarkii, *Berk. & Broome.*
Among grass. A.

H. irrigatus, *Pers.*
Among grass. A.

H. ceraceus, *Wulf.*
Among grass. A.

H. coccineus, *Schaeff.*
Open places among grass and moss. Q.

Hygrophorus—*cont.*

H. miniatus, *Fries.*
Among short grass. Q

H. puniceus, *Fries.*
Among grass under trees. A.

H. obrusseus, *Fries.*
Short grass in open places. A.

H. conicus, *Scop.*
Among grass in open places. A.

H. calyptræformis, *Berk.*
Among grass in open places. A.
Var. **niveus**, *Cke.*
Among grass. A.

H. chlorophanus, *Fries.*
Grassy places. A., P.

H. psittacinus, *Schaeff.*
Among short grass A.

Lactarius, *Fries.*

L. torminosus, *Schaeff.*
Among grass. A very elegant fungus of a pale buff colour, and covered, especially near the margin, with shaggy scales. Like all the species of *Lactarius*, this fungus exudes a quantity of milky-looking fluid when broken. In some species this fluid is white, like milk, in others yellow or red. In some species the liquid is insipid, in others, as the present, very hot, and causing a tingling of the tongue. A.

L. turpis, *Fries.*
On the ground under trees. A., P.

L. controversus, *Pers.*
Under trees. A.

L. pubescens, *Schrad.*
Grassy places. A.

L. blennius, *Fries.*
On the ground under trees. A., P.

L. pyrogalus, *Bull.*
On the ground under trees. A., Q.

L. quietus, *Fries.*
Under trees. Q.

Lactarius—*cont.*

L. aurantiacus, *Fries.*
Among grass. A.

L. rufus, *Scop.*
Under pines. A.

L. glyciosmus, *Fries.*
Under trees. A., Q.

L. volemus, *Fries.*
On the ground under trees. Edible. A., Q.

L. serifluus, *DC.*
Under trees. A., Q.

L. subdulcis, *Bull.*
Among grass under trees. A., Q.

L. camphoratus, *Bull.*
Under trees. A.

Russula, *Fries.*

R. nigricans, *Bull.*
Among grass. A., Q.

R. albo-nigra, *Kromb.*
Among grass. A.

R. adusta, *Fries.*
Among grass. A., Q.

R. densifolia, *Gillet.*
Under beeches. A.

R. mustelina, *Fries.*
Under beeches. A.

R. olivascens, *Fries.*
Under oaks. A.

R. furcata, *Fries.*
Under trees. A., Q.
Var. **pictipes**, *Cke.*
Under trees. A.
Var. **ochroviridis**, *Cke.*
Under trees. A.

R. rosacea, *Fries.*
Grassy places. A.

R. maculata, *Quélet.*
On naked ground under trees. A.

R. sardonia, *Fries.*
Among grass. A.

R. purpurea, *Fries.*
Under beeches. A.

Russula—*cont.*

R. lactea, *Pers.*
Under beeches. A.

Var. **incarnata**, *Quélet.*
Under beeches. A.

R. virescens, *Schaeff.*
Among grass. A.

R. cutefracta, *Cke.*
Under pines. A.

R. rubra, *Fries.*
Among grass under trees. A., Q.

Var. **sapida**, *Quélet.*
Under beeches. A.

R. Linnaei, *Fries.*
Under beeches. A.

R. xerampelina, *Schaeff.*
Among grass under trees. A., Q.

R. olivacea, *Schaeff*
Under beeches. A.

R. serotina, *Quélet.*
Shady places among grass. A.

R. vesca, *Fries.*
Among grass under trees. This fungus is edible, and the flavour very good, but as there are so many poisonous species in the genus, it requires knowledge to be certain that you are dealing with the right species. A.

R. lilacea, *Quélet.*
Under various trees. A.

R. cyanoxantha, *Schaeff.*
Grassy places. A.

R. heterophylla, *Fries.*
Among grass under oaks. A.

R. galochroa, *Bull.*
Under beeches. A.

R. consobrina, *Fries.*
Among grass under trees. A.

Var. **intermedia**, *Cke.*
Under beeches. A.

Var. **sororia**, *Fries.*
Under beeches. A.

Russula—*cont.*

R. foetens, *Pers.*
Under trees. A., Q.

R. subfoetens, *W. G. Smith.*
Under beeches. A.

R. fellea, *Fries.*
Under trees. Entirely pale straw colour, taste very bitter. Poisonous. A.

R. expallens, *Gillet.*
Under trees among grass. A.

R. elegans, *Bres.*
Among grass under beeches. A.

R. emetica, *Fries.*
Among grass. A very beautiful fungus, cap varying from pale rose-colour to deep crimson, remainder snow-white. Very poisonous, nevertheless it appears to be a favourite food plant for slugs and snails, it being often difficult to find a single specimen out of scores that has not been more or less eaten. A.

Var. **Clusii**, *Fries.*
Among grass. A.

Var. **fallax**, *Schaeff.*
Among grass. A.

R. fingibilis, *Britz.*
Among grass under oaks. A.

R. pectinata, *Bull.*
On the ground under trees. A.

R. ochracea, *Fries.*
Under trees. A.

R. granulosa, *Cke.*
Under trees. A., Q.

R. æruginea, *Fries.*
Among grass. A.

R. citrina, *Gillet.*
Grassy and shady places. A.

R. fragilis, *Fries.*
Among grass. A.

Var. **niveus**, *Pers.*
Under trees among grass and leaves. A.

Russula—*cont.*

R. punctata, *Gillet.*
Among grass. A.

Var. **leucopus**, *Cke.*
Among grass. A.

R. veternosa, *Fries.*
Among grass under trees. A.

R. integra, *L.*
Among grass under oaks and beeches. A.

R. decolorans, *Fries.*
Among grass. A.

R. Barlae, *Quélet.*
Under beeches. A.

Var. **cuprea**, *Kromb.*
Under beeches. A.

R. nitida, *Pers.*
Among short grass under trees. A., Q.

R. alutacea, *Fries.*
Under trees. A.

R. armeniaca, *Cke.*
Under pines. A.

R. puellaris, *Fries.*
Among short grass. A.

Var. **intensior**, *Cke.*
Among grass. P.

Var. **roseipes**, *Secr.*
Under beeches among grass. A.

R. ochroleuca, *Pers.*
Among grass under beeches. A.

R. chamaeleontina, *Fries.*
On naked ground under beeches. A.

R. lutea, *Huds.*
Among short grass in shady places. A., Q.

R. nauseosa, *Pers.*
Among short grass. A.

R. vitellina, *Pers.*
Under trees. A.

Cantharellus, *Fries.*

C. cibarius, *Fries.*
Under beeches. A thick, fleshy fungus of a uniform pale, dull orange colour, and an agreeable smell, resembling that of apricots. Generally acknowledged throughout Europe as one of the best among edible fungi, if properly prepared. A.

C. aurantiacus, *Fries.*
Among short grass in damp places. Somewhat resembling *C. cibarius* in colour and general appearance, but a slenderer plant. Poisonous. A., Q.

C. carbonarius, *Alb. & Schw.*
Burnt ground. Q.

C. infundibuliformis, *Fries.*
Among grass. A.

C. muscigenus, *Bull.*
On mosses (*Hypnum*). A.

C. lobatus, *Fries.*
On mosses. A.

Nyctalis, *Fries.*

N. asterophora, *Fries.*
On dead fungi (*Russula nigricans*). Q.

Marasmius, *Fries.*

M. urens, *Fries.*
Among grass. A.

M. peronatus, *Bolton.*
Among grass. A very common fungus under trees; the stem is shaggy with yellowish down. Taste very pungent; poisonous. A., Q.

M. oreades, *Fries.*
Among grass in open places. Popularly known as the "Champignon"; grows in open pastures and often forms "fairy rings." Esteemed as an article of food, or rather as a seasoning in France and Italy. A., P., Q.

M. prasiosmus, *Fries.*
Among dead leaves under trees. Q.

M. erythropus, *Pers.*
On stumps. Q.

Marasmius—*cont.*

M. archyropus, *Fries.*
Among leaves. A.

M. ramealis, *Bull.*
On dead bramble stems. Q.

M. alliaceus, *Jacq.*
Among dead leaves. A.

M. Rotula, *Scop.*
On dead twigs lying on the ground. A., Q.

M. androsaceus, *L.*
On dead branches. A.

M. insititius, *Fries.*
On dead twigs. A., P.

M. Hudsoni, *Pers.*
On dead holly leaves. A.

M. epiphyllus, *Fries.*
On dead leaves. A., Q.

Lentinus, *Fries.*

L. tigrinus, *Fries.*
On dead wood. A.

L. lepideus, *Fries.*
On dead wood. A., Q.

L. cochleatus, *Fries.*
On stumps. Has a very agreeable, spicy smell, and is edible. Q.

Panus, *Fries.*

P. stypticus, *Fries.*
On dead logs. A.

Lenzites, *Fries.*

L. betulina, *L.*
On stumps. A.

L. abietina, *Fries.*
On fir rails. Q.

Hiatula, *Fries.*

H. Wynniae, *Berk. & Broome.*
On soil in a stove. Phosphorescent in the dark, emitting a pale greenish light. A native of Ceylon. (*Ann. Mag. Nat. Hist.*, 1879, p. 206; *Illustr. Brit. Fung.*, pl. 688.)

Volvaria, *Fries.*

V. bombycina, *Schaeff.*
On living elm trees. A very beautiful fungus, sometimes growing to a large size. A specimen of this fungus growing on a living elm in the grounds, weighed $2\frac{3}{4}$ pounds; diameter of cap when expanded, 14 inches; stem 8 inches long by 2 inches thick; gills $1\frac{1}{2}$ inches broad. A figure along with the specimen is in the Herbarium. A.

V. gloiocephala, *Fries.*
On the ground. Poisonous. A.

V. temperata, *Berk. & Broome.*
On soil in a hot-house.

V. speciosa, *Fries.*
On the ground. Poisonous. A.

Pluteus, *Fries.*

P. cervinus, *Schaeff.*
On stumps and logs. A.

P. nanus, *Pers.*
On stumps and on the ground. A., Q.

Entoloma, *Fries.*

E. sinuatum, *Fries.*
On the ground under trees. Poisonous. Q.

E. jubatum, *Fries.*
On the ground among grass. Q.

E. sericellum, *Fries.*
On the ground among grass. Q.

E. clypeatum, *L.*
On the ground under trees. A., P.

E. rhodopolium, *Fries.*
On the ground. A.

E. costatum, *Fries.*
On the ground among grass. A.

E. sericeum, *Bull.*
In grassy places. A.

E. nidorosum, *Fries.*
On the ground under trees. A., Q.

Clitopilus, *Fries.*

C. prunulus, *Scop.*
Under trees. A.

C. cancrinus, *Fries.*
On the ground. A.

C. carneo-albus, *Wither.*
Among grass. A.

Leptonia, *Fries.*

L. lampropoda, *Fries.*
Among short grass. A.

L. anatina, *Lasch.*
Among short grass. A.

L. serrulata, *Pers.*
Among grass. A., P.

L. chalybea, *Pers.*
On stumps. Q.

L. chloropolia, *Fries.*
Among short grass. A.

Nolanea, *Fries.*

N. pascua, *Pers.*
Among short grass. A., P.

N. mammosa, *Fries.*
Among grass. A.

Eccilia, *Fries.*

E. Acus, *W. G. Smith.*
On pine leaves. A.

E. rhodocylix, *Lasch.*
On the ground. A.

Claudopus, *W. G. Smith.*

C. variabilis, *Pers.*
On twigs. A.

C. depluens, *Batsch.*
On wood. A., Q.

C. byssisedus, *Pers.*
On wood. A., Q.

Pholiota erebia, *Fries.*
On the ground under cedars. P.

P. togularis, *Bull.*
On the ground. A.

P. dura, *Bolton.*
On the ground. Q.

P. praecox, *Pers.*
Among grass. A., P.

Pholiota—*cont.*

P. radicosa, *Bull.*
On the ground near trunks. Q.

P. Aegerita, *Fries.*
On trunks. Q.

P. squarrosa, *Müll.*
On stumps. A.

P. spectabilis, *Fries.*
On trunks. Q.

P. adiposa, *Fries.*
On trunks. Q.

P. mutabilis, *Schaeff.*
On logs. A.

P. marginata, *Batsch.*
On fallen pine leaves. A.

Inocybe, *Fries.*

I. pyriodora, *Pers.*
On the ground under trees. A., Q.

I. incarnata, *Bres.*
Among grass under trees. Q.

I. scaber, *Müll.*
On the ground. A.

I. fasciata, *Cke. & Mass.*
A species remarkable in the genus *Inocybe* for growing in dense tufts. (*Grev.* xvii., 52; *Illustr. Brit. Fungi*, pl. 1173.) A.

I. Bongardii, *Weinm.*
Among short grass. A.

I. echinata, *Roth.*
On soil in the Temperate House.

I. asterospora, *Quélet.*
On the ground under trees. A.

I. perbrevis, *Weimn.*
Among short grass. A.

I. scabella, *Fries.*
On the ground under trees. Varying in colour from pure white to a beautiful pale lilac. A., Q.

I. geophylla, *Sow.*
On the ground under trees. A form with a pale bluish-grey pileus is not uncommon; sometimes white. A., P.

Hebeloma, *Fries*.

H. fastibile, *Fries*.

On the ground under trees. Smell strong and unpleasant; poisonous. A.

H. firmum, *Fries*.

On the ground under *Pinus sylvestris*. A.

H. claviceps, *Fries*.

On the ground. A.

H. mesophaeum, *Fries*.

Under fir trees. A.

H. sinapizans, *Fries*.

On the ground near stumps. A., Q.

H. crustuliniforme, *Bull*.

On the ground. Smell strong and unpleasant; poisonous. A.

H. longicaudum, *Pers*.

Under trees. Q.

Flammula, *Fries*.

F. purpurata, *Cke. & Mass.*

On tree-fern stems; in the Fern House. (*Grev.* xviii., 73; *Illustr. Brit. Fungi*, pl. 964.) (*See* plate.)

F. gymnopodia, *Bull*.

On the ground. A.

F. lenta, *Pers*.

On the ground under trees. Q.

F. spumosa, *Fries*.

On buried wood. A.

F. carbonaria, *Fries*.

On burnt ground. A.

F. flavida, *Schaeff.*

On wood. A., Q., P.

F. inopoda, *Fries*.

On rotten trunks. This fungus will probably prove to be a species of *Hypholoma*. A.

F. sapinea, *Fries*.

Under pines. A.

Naucoria, *Fries*.

N. hamadrya, *Fries*.

Among grass. A.

Naucoria—*cont.*

N. ceratodes, *Fries*.

Among grass. A.

N. melinoides, *Fries*.

Among short grass. A., Q.

N. striaepes, *Cke*.

Among grass. P.

This remarkably fine species of *Naucoria* was first observed on a lawn near the Herbarium in 1885, and has been noted in the same locality every year since that time. It has also been collected in Yorkshire. (*Grev.* xiii., 60; *Illustr. Brit. Fungi*, pl. 478.)

N. pediades, *Fries*.

Among short grass. A., P.

N. tabacina, *D.C.*

On naked ground. A.

N. temulenta, *Fries*.

Among moss and grass. A.

Galera, *Fries*.

G. tenera, *Schaeff.*

Among grass. A., Q.

G. Hypnorum, *Batsch*.

Among grass, common everywhere.

Var. **Bryorum**, *Pers*.

Among moss and grass. A.

Tubaria, *Fries*.

T. furfuracea, *Pers*.

On twigs and chips. A.

T. crobula, *Fries*.

On fallen branches. A.

Crepidotus, *Fries*.

C. mollis, *Schaeff.*

On decaying trunks. Q.

Chitonia, *Fries*.

C. rubriceps, *Cke. & Mass.*

On soil in the Aroid House. A very remarkable fungus, the first European representative of the genus. In all probability imported with soil or plants from the Southern

Chitonia—*cont.*

Hemisphere. (*Grev.* xv., 57; *Illustr. Brit. Fungi*, pl. 967.) (*See* plate.)

Bolbitius, *Fries.*

B. tener, *Berk.*

Among grass. A.

Cortinarius, *Fries.*

C. glaucopus, *Fries.*

On the ground under trees. Q.

C. coerulescens, *Fries.*

Under trees. A.

C. purpurascens, *Fries.*

Among grass under trees. Q.

C. mucifluus, *Fries.*

Under trees. A.

C. ochroleucus, *Schaeff.*

Among grass. The most abundant species of this large genus, which is but sparsely represented in the grounds. A.

C. cinnamomeus, *Fries.*

Under trees. Q.

C. torvus, *Fries.*

Among grass under trees. There is some difference of opinion in different European countries as to this species; but specimens from Kew were submitted to Fries, who stated that they exactly represented his idea of the species. Q.

C. hinnuleus, *Fries.*

Under trees. A.

C. leucopus, *Bull.*

Among grass. A small form of this species having the pileus about 1·5 cm. across is not uncommon. A.

C. castaneus, *Fries.*

On the ground. A single specimen, so far as I am aware, has only been collected. A.

Paxillus, *Fries.*

P. orcelloides, *Cke. & Mass.*

On the ground among grass. (*Grev.* xvi., 46; *Illustr. Brit. Fungi*, pl. 874.) Q.

Paxillus—*cont.*

P. involutus, *Batsch.*

On the ground; common everywhere. Edible.

P. leptopus, *Fries.*

On rotten wood. Q.

Agaricus, *L.*

A. campestris, *L.*

Among grass. This is usually considered as the most delicious of all edible fungi, and is generally spoken of as the meadow mushroom. Although supposed to be the only species sold, it is in reality rare in the market as a cultivated species. A.

A. augustus, *Fries.*

Naked soil. This beautiful species occurred in abundance one season. It is larger and the flavour much superior to that of the common mushroom. A.

A. arvensis, *Schaeff.*

Among grass. It is to be found every season under elm trees. Edible, and by some considered superior to the mushroom. Popularly known as the Horse mushroom. P.

A. comptulus, *Fries.*

Among grass. A.

A. sagatus, *Fries.*

Under trees. A.

Stropharia, *Fries.*

S. Coronilla, *Bull.*

Among grass. A neat little fungus, superficially closely resembling *Agaricus comptulus*, but distinguished by the gills being attached to the stem. Poisonous. A., P.

S. squamosa, *Fries.*

On heaps of leaves and decaying vegetable matter in damp places. A.

S. thrausta, *Kalchb.*

On decaying vegetable matter, and on the ground in damp places. A., Q.

Stropharia—*cont.*

S. merdaria, *Fries.*
On dung. A.

S. stercoraria, *Fries.*
On dung. A., P.

S. aeruginosa, *Curtis.*
Among grass. Common. Poisonous.

S. semiglobata, *Batsch.*
On dung. Poisonous. A., P.

Hypholoma, *Fries.*

H. sublateritium, *Fries.*
On stumps. Poisonous. A., Q.

Var. **squamosum**, *Cke.*
On stumps. A.

H. epixanthum, *Fries.*
On stumps. Q.

H. fasciculare, *Hudson.*
On and around stumps. Common. Poisonous.

Var. **eleodes**, *Fries.*
On stumps. A.

H. velutinum, *Pers.*
On the ground near decaying wood. A., Q.

H. pyrotrichum, *Holms.*
On the ground. A.

H. candolleanum, *Fries.*
On stumps and buried wood. A., B., Q.

H. appendiculatum, *Bull.*
On rotten wood. Common.

H. catarium, *Fries.*
On the ground. A.

H. capnoides, *Fries.*
On the ground near stumps. Q.

H. hydrophilum, *Bull.*
On the ground. A.

Psilocybe, *Fries.*

P. semilanceata, *Fries.*
Among short grass. Common. Poisonous.

Var. **coerulescens**, *Cke.*
Among grass. A. Differs from the typical form only in being blue or greenish at the base of the stem.

P. spadicea, *Schaeff.*
On the naked ground. A.

P. foenisecii, *Pers.*
Among grass. Common.

Psathyra, *Fries.*

P. corrugis, *Pers.*
On naked soil. A.

P. semivestita, *Berk. & Broome.*
Among grass. It is only during the young state that the pileus is covered with white, floccose down; when fully developed it is usually quite naked. A.

Panaeolus, *Fries.*

P. egregius, *Mass.*
Among grass. A.

P. fimiputris, *Bull.*
On dung. A., P.

P. retirugis, *Batsch.*
On dung. A.

P. campanulatus, *L.*
Among grass. Common.

P. papilionaceus, *Bull.*
Among grass. Common.

Anellaria, *Karsten.*

A. separata, *Karsten.*
On dung. A., P.

A. fimiputris, *Karsten.*
On dung. Common.

Psathyrella, *Fries.*

P. gracilis, *Fries.*
On naked ground under hedges, &c. A.

P. hiascens, *Fries.*
On the ground under trees. A.

P. atomata, *Fries.*
On the ground under hedges, &c. Common.

P. disseminata, *Fries.*
On decaying trunks and stumps. A., Q.

Coprinus, *Fries.*

C. comatus, *Fries.*
On rich soil and on heaps of decayed leaves. A very elegant fungus when well developed, some specimens attaining a height of 14 inches. One of the best and safest of edible fungi. A figure of this species is exhibited in No. 2 Museum. A., Q.

C. sterquilinus, *Fries.*
On dung and rich soil. A., P.

C. atramentarius, *Fries.*
On the ground near decaying wood. Common. Edible, but not equal in flavour to *Coprinus comatus*.

C. soboliferus, *Fries.*
On the ground. Probably only a variety of *C. atramentarius*. Edible. P.

C. fimetarius, *Fries.*
On manure heaps, &c. Common.

C. niveus, *Fries.*
On dung. Common.

C. micaceus, *Fries.*
On the ground near stumps, posts, &c. Growing in dense clusters; the pileus when young is thickly dusted with glittering particles resembling fragments of mica.

Coprinus—*cont.*

C. deliquescens, *Bull.*
On trunks, heaps of decaying leaves, &c. Common.

C. tardus, *Karsten.*
On the ground near buried wood. A.

C. tuberosus, *Quélet.*
On dung. An interesting little species, springing from a small black sclerotium. The sclerotia were found by Mr. G. Nicholson, the Curator of the Gardens; the sporophores appeared a week after the sclerotia were placed in damp earth. This is the first British record for this species, which was established by Quélet from French specimens (*Bull. Soc. Bot. France*, xxiv., 289, pl. 3, 1877). B.

C. Hendersoni, *Berk.*
On soil in hot beds.

C. Lagopus, *Fries.*
On rich soil. A., P.

C. radiatus, *Fries.*
On dung. Common. A very minute and delicate fungus lasting only for a few hours; only about 2 lines across.

C. stercorarius, *Fries.*
On dung, rich soil, &c. Common.

C. ephemerus, *Fries.*
On manure heaps, &c. Common.

Polyporeæ.

Boletus, *Dill.*

B. luteus, *L.*
Under pines. A.

B. elegans, *Schum.*
Under pines. A.

B. flavus, *With.*
On the ground under trees. A.

B. chrysenteron, *Fries.*
On the ground. The most abundant species in the grounds. Very handsome, with its olive cap and bright lemon-yellow under surface. Poisonous.

Boletus—*cont.*

B. subtomentosus, *L.*
On the ground. Common.

B. cruentus, *Vent.*
On the ground under beeches. Smell strong; flesh changing to red when cut or bruised. A.

B. impolitus, *Fries.*
Under trees. A.

Boletus—*cont.*

B. fulvidus, *Fries.*
Under trees. A.

B. castaneus, *Bull.*
Under trees. A rare fungus, readily recognised by the minutely velvety pale chestnut-coloured pileus and stem. A.

B. spadiceus, *Schaeff.*
Under trees. A.

B. radicans, *Pers.*
Under trees. A.

B. duriusculus, *Schulzer.*
On the ground. The flesh turns copper-coloured when cut or bruised. A.

B. radicans, *Pers.*
Among grass under trees. A.

B. badius, *L.*
Among grass. A., Q.

B. bovinus, *L.*
Under pines. A.

B. granulatus, *L.*
Under trees. Edible. A.

B. tenuipes, *Cke.*
Under beeches. A.

B. regius, *Kromb.*
Among grass. A very beautiful fungus with a bun-shaped rose-coloured cap or pileus 4–6 inches across. A.

B. luridus, *Schaeff.*
On the ground under trees. A common species in the grounds, readily known by the dark olive-green pileus, and the blood-red under surface and stout stem. The pale yellow flesh instantly changes to a deep indigo-blue colour when broken. Poisonous. A., Q.

B. edulis, *Bull.*
On the ground. The cap or pileus resembles a penny bun in shape, size, and colour. Edible. Q.

B. purpureus, *Fries.*
Under trees A.

Boletus—*cont.*

B. rubinus, *W. G. Smith.*
Under beeches. A.

B. viscidus, *L.*
Under trees. Q.

B. laricinus, *Berk.*
Under pines. A.

B. scaber, *Fries.*
Among grass. Edible. A., Q.

B. caespitosus, *Mass.*
Among grass under trees. The only British species of *Boletus* that grows in dense clusters. (*Brit. Fungus-Flora*, i., 297.) A.

Fistulina, *Bull.*

F. Hepatica, *Fries.*
On living trunks of old oak trees. When well grown forming large flaps weighing 1 lb. to 2 lbs. each. Texture fibrous and resembling raw beef when cut in slices, hence the popular name beefsteak fungus. Edible. A., B.

Polyporus, *Micheli.*

P. rufescens, *Fries.*
On stumps. Q.

P. squamosus, *Fries.*
On living trunks of various trees. Common. An elegant fungus, but a destructive parasite.

P. melanopus, *Fries.*
On buried wood. A.

P. picipes, *Fries.*
On willow trunks. A., Q.

P. varius, *Fries.*
On fallen trunks and stumps. A., P.

P. elegans, *Fries.*
On birch trunk. Q.

Var. **nummularius**, *Fries.*
On fallen trunks. Q.

P. giganteus, *Fries.*
At the base of trunks. The large overlapping pilei often form patches 2–3 feet across. A.

Polyporus—*cont.*

P. sulphureus, *Fries.*

On living trunks of various trees. Common. Distinguished by the bright sulphur colour of every part, and the very disagreeable smell. A destructive parasite to trees.

P. salignus, *Fries.*

On willow trunks, which are destroyed by it. A.

P. dryadeus, *Fries.*

Parasitic on oak trunks, usually growing near the base. A.

P. hispidus, *Fries.*

On living trunks of various trees. A very destructive parasite. A., Q.

P. cuticularis, *Fries.*

On beech trunk. A parasitic species. A.

P. mollis, *Fries.*

On dead pine wood. Q.

P. Destructor, *Fries.*

On worked wood, which it destroys.

P. betulinus, *Fries.*

Parasitic on birch trunks. Q.

P. fumosus, *Fries.*

On stumps. Common.

P. chioneus, *Fries.*

On pine trunks. A.

P. caesius, *Fries.*

On decayed pine trunk. Q.

P. armeniacus, *Berk.*

On stumps and dead wood. Q.

Fomes, *Fries.*

F. lucidus, *Fries.*

On decaying trunks. Reddish-chestnut colour; the pileus gives out a viscid secretion which soon hardens, when it presents the appearance of having been varnished. A.

F. ulmarius, *Fries.*

On old elm trunks. A.

F. connatus, *Fries.*

On old trunks. Q.

Fomes—*cont.*

F. fomentarius, *Fries.*

On living trunks of various trees, which it eventually kills if not removed. The substance of this fungus was at one time used for making tinder; at the present day it is manufactured into a felt-like material, which is used for making a great variety of articles, as chest preservers, purses, slippers, caps, &c. A selection of articles manufactured from this material are exhibited in No. 2 Museum. A., P.

F. nigricans, *Fries.*

On living birch trunk. A parasitic species. Q.

F. salicinus, *Fries.*

On willow trunks. A.

F. fraxineus, *Fries.*

On old ash trunks. A.

F. annosus, *Fries.*

Base of trunks, stumps, &c. A very destructive fungus, especially to Conifers. Q.

F. applanatus, *Fries.*

On dead trunks. Q.

F. conchatus, *Fries.*

On willow trunks. A.

F. ferruginosus, *Mass.*

On dead trunks, posts, &c. A., Q.

Polystictus, *Fries.*

P. perennis, *Fries.*

On the ground under beeches. A.

P. versicolor, *Fries.*

On dead trunks, stumps, &c. Common.

P. hirsutus, *Fries.*

On trunks, posts, &c. Common.

P. velutinus, *Fries.*

On trunks and stumps. Common.

P. abietinus, *Fries.*

On decaying fir tree. A.

Poria, *Pers.*

P. vaporaria, *Fries.*
On fallen branches. Common. Usually a saprophyte, but sometimes becoming parasitic, and destroying Conifers.

P. Medulla-panis, *Fries.*
On rotten wood. Q.

P. blepharistoma, *Berk. & Broome.*
On dead wood. A., P.

P. sanguinolenta, *Alb. & Schw.*
On dead wood. A.

Trametes, *Fries.*

T. gibbosa, *Fries.*
On stumps. Q.

T. serpens, *Fries.*
On fallen bark. Q.

Daedalea, *Pers.*

D. quercina, *Pers.*
On oak stumps. A.

D. unicolor, *Fries.*
On posts. Q.

Merulius, *Hall.*

M. lacrymans, *Fries.*
On old boards. Popularly known as "dry-rot." Very rare in woods, but too well known for the destruction it causes with worked timber in badly ventilated places. Fine specimens of this fungus are exhibited in No. 2 Museum.

M. Corium, *Fries.*
On dead branches. Q.

M. tremellosus, *Schrad.*
On dead wood. P.

Hydneæ.

Hydnum, *L.*

H. Weinmanni, *Fries.*
On rotten poplar. Q.

H. alutaceum, *Fries.*
On rotten wood. A.

H. viride, *Fries.*
On rotten wood. A.

H. niveum, *Pers.*
On dead wood. A., Q.

H. farinaceum, *Pers.*
On rotten pine boards. A.

Caldesiella, *Saccardo.*

C. ferruginosa, *Saccardo.*
On decaying wood. A.

Irpex, *Fries.*

I. fusco-violaceus, *Fries.*
On pine trunks. This fungus is said to become parasitic on pines. It is doubtful as to whether this species is more than a form of *Polystictus abietinus* with torn pores. A.

Radulum, *Fries.*

R. quercinum, *Fries.*
On dead oak branches. A.

Radulum—*cont.*

R. orbiculare, *Fries.*
On dead bark of various trees. A.

Phlebia, *Fries.*

P. vaga, *Fries.*
On dead wood. Q.

P. radiata, *Fries.*
On dead wood. Q.

P. merismoides, *Fries.*
On dead wood. Q.

Grandinia, *Fries.*

G. granulosa, *Fries.*
On fallen branches. A.

G. crustosa, *Fries.*
On dead wood. A.

Odontia, *Pers.*

O. fimbriata, *Pers.*
On fallen branches. Q.

Kneiffia, *Fries.*

K. setigera, *Fries.*
On fallen branches. A.

Thelephoreæ.

Solenia, *Hoffmann.*

S. fasciculata, *Pers.*
On dead wood. B.

Cyphella, *Fries.*

C. capula, *Fries.*
On dead bramble stem. Q.

C. albo-violacea, *Karsten.*
On dead bark. B.

C. villosa, *Karsten.*
On rotten twigs. A.

Craterellus, *Fries.*

C. cornucopioides, *Pers.*
On the ground. A quaint looking fungus, resembling a black funnel with a wavy margin. Edible, and with an excellent flavour. Q.

Stereum, *Pers.*

S. spadiceum, *Fries.*
On dead branches. Common.

S. rugosum, *Fries.*
On dead branches. Common.

S. sanguinolentum, *Fries.*
On decaying pine plank. The hymenium becomes blood-red when scratched or bruised. A.

S. purpureum, *Pers.*
On dead trunks and branches. Common.

S. ochroleucum, *Fries.*
On dead bark, especially of *Aesculus Hippocastanum*. A.

S. hirsutum, *Fries.*
On dead trunks, branches, &c. Common. Is sometimes a destructive parasite on trees.

Corticium, *Pers.*

C. comedens, *Fries.*
On branches. Common. Developing under the bark, which is eventually thrown off. A parasite.

C. coeruleum, *Fries.*
On old posts. Of a beautiful clear blue colour, and with a silky sheen when well developed. One of the few British Fungi that are phosphorescent, emitting a pale bluish light in the dark. A.

C. flaveolum, *Mass.*
On trunk of a tree-fern in the Temperate House. Probably an introduced species.

C. sanguineum, *Fries.*
On fallen branches. Q.

C. polygonium, *Fries.*
On decaying bark. Q.

C. molle, *Fries.*
On pine bark. A.

C. roseolum, *Mass.*
On old worked wood. A.

C. lacunosum, *Berk. & Broome.*
On dead wood. A.

C. Sambuci, *Fries.*
On bark of *Sambucus nigra*. Q.

C. arachnoideum, *Berk.*
On dead wood branches, &c. A., Q.

C. confluens, *Fries.*
On bark of *Fagus sylvatica*. A.

C. lacteum, *Fries.*
On wood. A.

C. Lycii, *Cke.*
On *Lycium*. P.

C. populinum, *Fries.*
On poplar bark. A.

Hymenochaete, *Lév.*

H. rubiginosa, *Lév.*
On decorticated wood. A.

H. leonina, *Berk. & Curt.*
On dead wood. A.

H. corrugata, *Lév.*
On dead wood. A.

Peniophora, *Cke.*

P. quercina, *Cke.*
On oak branches. A.

P. gigantea, *Mass.*
On pine bark. A.

P. pezizoides, *Mass.*
On dead branches of *Aesculus Hippocastanum*. A.

Peniophora—*cont.*

P. rosea, *Mass.*
On wood. A.

P. incarnata, *Mass.*
On wood and bark. A., P.

P. ochracea, *Mass.*
Inside dead bark. Q.

P. cinerea, *Cke.*
On bark and wood. Common.

P. velutina, *Cke.*
On wood. A., Q.

P. phyllophila, *Mass.*
On dead leaves. A.

P. terrestris, *Mass.*
Running over branches, leaves, and the naked ground. A.

Soppittiella, *Mass.*

S. cristata, *Mass.*
On the ground, incrusting leaves, moss, &c. Q.

S. sebacea, *Mass.*
Running over various substances lying on the ground. A.

Thelephora, *Ehrh.*

T. caryophyllea, *Pers.*
On the ground. A.

Thelephora—*cont.*

T. terrestris, *Ehrh.*
On the ground under pines. A.

T. laciniata, *Pers.*
On the ground under pines. A.

Coniophora, *DC.*

C. olivacea, *Mass.*
On dead pine trunk. Q.

C. arida, *Karsten.*
On dead pine wood. Q.

C. sulphurea, *Mass.*
Running over heaps of dead leaves. A

C. ochracea, *Mass.*
On the inside of elm bark. Q.

C. pulverulenta, *Mass.*
On dead wood. Q.

C. membranacea, *DC.*
On damp wall of a potting shed.

C. incrustans, *Mass.*
Running over heaps of dead leaves. Q.

C. puteana, *Mass.*
On dead bark. A.

Clavarieæ.

Clavaria, *Vaillant.*

C. muscoides, *L.*
Among grass. A.

C. fastigiata, *L.*
Among grass. A.

C. kewensis, *Mass.*
On stump. Smell pleasant, resembling that of aniseed. B. (*See* plate).

C. coralloides, *L.*
On the ground under trees. Q.

C. cinerea, *Bull.*
On the ground. A.

C. cristata, *Holmsk.*
Under trees. Edible. Q.

C. rugosa, *Bull.*
Under trees. P., Q.

C. fusiformis, *Sow.*
Under trees. Q.

Clavaria—*cont.*

C. inæqualis, *Fl. Dan.*
Among grass. A.

C. argillacea, *Fries.*
Among grass. A.

C. vermicularis, *Scop.*
Among grass. Edible, taste resembling that of cheese-straws. A.

C. fragilis, *Holmsk.*
Among grass. A., Q.

C. uncialis, *Grev.*
On dead stems of various Umbellifers. Q.

Typhula, *Pers.*

T. erythropus, *Fries.*
On dead herbaceous stems. Q.

Typhula—*cont.*

T. phacorrhiza, *Fries.*
On dead herbaceous stems. B.

Pistillaria, *Fries.*

P. micans, *Fries.*
On dead thistle stems. Q.

Pistillaria—*cont.*

P. quisquilaris, *Fries.*
On dead herbaceous stems. Q.

DACRYOMYCETEÆ.

Dacryomyces, *Nees.*

D. deliquescens, *Duby.*
On pine rails, &c. Common.

D. stillatus, *Nees.*
On dead, damp wood. Common.

D. chrysocomus, *Fries.*
On soft decayed pine wood. A.

D. succineus, *Fries.*
On fallen pine leaves. A.

Ditiola, *Fries.*

D. radicata, *Fries.*
On rotten wood. A.

Calocera, *Fries.*

C. viscosa, *Fries.*
On oak wood. A., Q.

C. stricta, *Fries.*
On wood. Q.

C. striata, *Fries.*
On trunks. A.

TREMELLINEÆ.

Tremella, *Dill.*

T. lutescens, *Pers.*
On a stump. A.

T. mesenterica, *Retz.*
On dead branches. Common.

T. frondosa, *Fries.*
On fallen trunk. Q.

T. Tubercularia, *Berk.*
On fallen oak branches. A.

Exidia, *Fries.*

E. glandulosa, *Fries.*
On dead oak branches. A peculiar looking, black, gelatinous fungus, popularly known as "witches' butter." A.

Ulocolla, *Bref.*

U. saccharina, *Bref.*
On dead pine wood. A.

U. foliacea, *Bref.*
On stumps. Q.

AURICULARIEÆ.

Auricularia, *Bull.*

A. mesenterica, *Fries.*
On dead trunks. Common.

A. lobata, *Sommerf.*
On trunk. A.

Hirneola, *Fries.*

H. Auricula-judæ, *Berk.*
On dead branches of *Sambucus nigra.* Q.

Gastromycetes.

PHALLOIDEÆ.

Aseröe, *La Bill.*

A. rubra, *La Bill.*
On soil in a stove. A very beautiful fungus, resembling a stalked sea-anemone. The stem is pure white and the

Aseröe—*cont.*

spreading rays bright crimson. As is usual in the members of the present family, the very minute spores are immersed in mucus, which

Aseröe—*cont.*

has a sweet taste and a very disagreeable smell. Numerous flies are attracted by the smell, and readily eat the mucus, and by this means the spores are dispersed. An introduced species; a native of Queensland. (*See* plate.)

Phallus, *Micheli.*

P. impudicus, *L.*

On the ground. Readily detected by the smell, which is very offensive and observable at a distance. A., Q.

Mutinus, *Fries.*

M. caninus, *Fries.*

On the ground. Smell only slight. A., Q.

Lycoperdon, *Tournefort.*

L. echinatum, *Pers.*

On the ground. A.

L. atropurpureum, *Vitt.*

Under trees. Q.

L. saccatum, *Vahl.*

Among grass under trees. Common.

Lycoperdon—*cont.*

L. gemmatum, *Batsch.*

Among grass under trees. Common.

L. pyriforme, *Schæff.*

On rotten wood. Common.

L. coelatum, *Bull.*

Among grass. A., P.

L. Bovista, *L.*

Among grass. The largest British puff-ball, sometimes reaching a diameter of 12 inches. Edible, having a very delicate flavour. A.

Bovista, *Dill.*

B. plumbea, *Berk.*

Among grass. Common.

B. nigrescens, *Vitt.*

Among grass. Common.

B. pusilla, *Mass.*

Among grass. A.

B. ovalispora, *Cke. & Mass.*

Among grass. A.

Sclerodermeæ.

Scleroderma, *Pers.*

S. vulgare, *Fries.*

On the ground under trees. Common.

S. verrucosum, *Pers.*

On the ground. Common.

S. Bovista, *Fries.*

On the ground. A., Q.

Scleroderma—*cont.*

S. Geaster, *Fries.*

On the ground. The species of *Scleroderma* are often mistaken for truffles, but are quite distinct, and are not edible. The Tuberaceæ or truffle family are absent from the grounds. A., Q.

Nidularieæ.

Cyathus, *Haller.*

C. striatus, *Hoffm.*

On twigs and wood on the ground. Common. This species, along with the next, are popularly known as the "birds'-nest fungus."

C. vernicosus, *DC.*

On the ground. Common.

Crucibulum, *Tul.*

C. vulgare, *Tul.*

On wood and twigs. A.

Nidularia, *Tul.*

N. pisiformis, *Tul.*

On wood. A.

Sphaerobolus, *Tode.*

S. stellatus, *Tode.*

On damp wood in a plant house. A minute but very beautiful fungus, at first ball-shaped, then splitting above into several teeth, and ejecting to some distance a little yellow ball containing the spores.

Thelebolus, *Tode.*

T. terrestris, *Alb. & Schw.*

On heaps of dead leaves. A.

ASCOMYCETES.

Pyrenomycetes.

Erysipheæ.

All the species belonging to this family are parasites, and in some instances very destructive to cultivated crops. They appear under the form of a delicate white film on living leaves.

Podosphaera, *Kunze.*

P. Oxyacanthae, *De Bary.*

On living leaves of *Crataegus.* Common.

P. tridactyla, *De Bary.*

On living leaves of various species of *Prunus.* Common.

Sphaerotheca, *Lév.*

S. pannosa, *Lév.*

On leaves, young shoots, flowers, and fruit of cultivated roses. A dangerous enemy to roses, causing the foliage to drop prematurely.

S. Castagnei, *Lév.*

On living leaves of various cucurbitaceous plants. When abundantly developed, the leaves present the appearance of having received a coat of whitewash.

Phyllactinia, *Lév.*

P. suffulta, *Saccardo.*

On leaves of *Lonicera, Betula alba, Cornus sanguinea.*

Uncinula, *Lév.*

U. Bivonae, *Lév.*

On living leaves of *Ulmus campestris.*

U. adunca, *Lév.*

On leaves of *Populus nigra.*

U. Prunastri, *Saccardo.*

On leaves of *Prunus spinosa.*

U. Aceris, *Saccardo.*

On living leaves of *Acer Pseudoplatanus.*

Microsphaera, *Lév.*

M. Dubyi, *Lév.*

On living leaves of *Lonicera Caprifolium.*

M. Berberidis, *Lév.*

On living leaves of *Berberis vulgaris.*

M. penicillata, *Lév.*

On living leaves of *Lonicera sempervirens* and *Betula pubescens.*

Erysiphe, *Hedwig.*

E. lamprocarpa, *Lév.*

On living leaves of *Aster grandiflorus, Centaurea nigrescens, Cousinia uncinata,* and many other composites.

E. Umbelliferarum, *De Bary.*

On living leaves of many umbelliferous plants. Common.

E. communis, *Fries.*

On living leaves of various plants. Common.

PERISPORIEÆ.

Eurotium, *Link.*

E. Herbariorum, *Link.*
On decaying plants. Common.

E. lateritium, *Mont.*
On damp, decaying plants.

Perisporium, *Fries.*

P. vulgare, *Corda.*
On rotting sacking.

CAPNODIEÆ.

Capnodium, *Mont.*

C. Salicinum, *Mont.*
On living branches and leaves of *Salix viminalis* and *S. Caprea.*

C. Tiliae. *Saccardo.*
On living leaves of *Tilia parvifolia.*

Antennaria, *Link.*

A. laevigata, *Corda.*
On bark of *Betula alba.*

HYPOCREÆ.

Claviceps, *Tul.*

C. purpurea, *Tul.*
Parasitic in the ovary of *Lolium perenne* and other grasses. The black, hornlike stroma of the fungus is known by the name of Ergot, and is used medicinally.

Cordyceps, *Fries.*

C. militaris, *Link.*
On the larva of some insect. A.

Epichloe, *Fries.*

E. typhina, *Pers.*
Parasitic on the living stems of *Holcus lanatus* and *H. mollis.*

Hypocrea, *Fries.*

H. rufa, *Pers.*
On dead wood.

Polystigma, *Pers.*

P. rubrum, *Pers.*
On living leaves of various species of *Prunus.*

Nectria, *Fries.*

N. cinnabarina, *Tode.*
On dead branches. A true and very destructive parasite, attacking trees and shrubs, the branches of which become thickly studded with coral-coloured tubercles one to two lines in diameter.

Nectria—*cont.*

N. Aquifolii, *Fries.*
On dead holly bark. A., B.

N. Lamyi, *Desm.*
On dead wood.

N. mammoidea, *Plow.*
On dead hawthorn.

N. Ribis, *Tode.*
On dead branches of *Ribes aureum.* Parasitic on various species of *Ribes.*

Hypomyces, *Fries.*

H. chrysospermus, *Tul.*
On various species of *Boletus* and *Agaricus.*

H. rosellus, *Alb. & Schw.*
On *Corticium*, *Stereum*, and *Poria.*

H. lateritius, *Fries.*
On *Poria vaporaria.*

Lasionectria, *Saccardo.*

L. roussellіana, *Mont.*
On dead wood.

Gibberella, *Saccardo.*

G. cyanogena, *Desm.*
On bark of *Sambucus nigra.*

Acrospermum, *Tode.*

A. compressum, *Tode.*
On dead herbaceous stems.

Xylarieæ.

Xylaria, *Hill.*

X. polymorpha, *Grev.*
On decaying logs.

X. digitata, *Fries.*
On dead wood.

X. vaporaria, *Berk.*
In soil in frames.

X. carpophila, *Fries.*
On fallen beech mast.

X. Hypoxylon, *Fries.*
On dead wood.

Nummularia, *Tul.*

N. Bulliardi, *Tul.*
On dead wood.

Hypoxylon, *Fries.*

H. coccineum, *Bull.*
On dead hazel.

H. fuscum, *Pers.*
On dead wood.

Dothideæ.

Phyllachora, *Fuckel.*

P. Ulmi, *Duv.*
On living leaves of *Ulmus.*

P. Trifolii, *Pers.*
On living leaves of *Trifolium medium.*

P. graminis, *Pers.*
On living leaves of various grasses.

Rhopographus, *Nitzke.*

R. filicinus, *Fries.*
On living fronds of *Pteris aquilina.*

Rhytisma, *Fries.*

R. acerinum, *Pers.*
On living leaves of *Acer campestre* and *A. Pseudoplatanus.* The large black blotches so common on sycamore leaves are caused by this fungus, which does considerable injury, causing the leaves to fall early in the season, consequently the wood is not properly matured, and the stock of accumulated food insufficient for the following year's growth. The fungus remains on the fallen leaves during the winter, and matures its fruit in the spring when the young sycamore leaves are inoculated. The disease can be arrested if the diseased leaves are collected and burned soon after they fall.

R. salicinum, *Fries.*
On living leaves of *Salix Caprea* and *S. viminalis.*

Stigmateæ.

Stigmatea, *Fries.*

S. Robertiani, *Fries.*
On living leaves of *Geranium robertianum.*

S. Ægopodii, *Fries.*
On living leaves of *Aegopodium.*

Diatrypeæ.

Diatrype, *Fries.*

D. Brassicae, *Cke.*
On dead cabbage stalks.

D. verruciformis, *Ehr.*
On dead branches of *Fagus sylvatica.*

D. quercina, *Fries.*
On dead branches of *Quercus.*

D. Stigma, *Hoffm.*
On dead wood.

Valseæ.

Valsa, *Fries.*

V. leucostoma, *Pers.*
On branches of *Prunus.*

V. stellulata, *Fries.*
On branches of *Ulmus campestris.*

V. Ailanthi, *Saccardo.*
On bark of *Ailanthus glandulosus.*

V. ceratophora, *Tul.*
On branches of *Ulmus montana.*

V. dissepta, *Fries.*
On branches of *Ulmus campestris.*

V. Betulae, *Tul.*
On bark of *Betula alba.*

V. Hippocastani, *Cke.*
On branches of *Aesculus Hippocastanum.*

V. taleola, *Fries.*
On bark of *Quercus.*

V. oncostoma, *Duby.*
On twigs of *Robinia Pseudo-cacia.*

Valsa—*cont.*

V. robergeana, *Desm.*
On dead fallen branches.

V. syngenesia, *Fries.*
On branches of *Sambucus nigra.*

V. platanoides, *Pers.*
On branches of *Acer Pseudo-platanus.*

V. nivea, *Fries.*
On dead branches of *Crataegus.*

Melanconis, *Tul.*

M. stilbostoma, *Fries.*
On bark of *Betula alba.*

Pseudovalsa, *De Not.*

P. umbonata, *Tul.*
On dead wood.

P. hapalocystis, *Berk. & Broome.*
On dead twigs of *Platanus acerifolia.*

Fenestella, *Tul.*

F. Salicis, *Rehm.*
On branches of *Salix.*

Eutypæ.

Eutypa, *Tul.*

E. Acharii, *Tul.*
On dead wood.

E. aspera, *Nitschke.*
On wood.

E. lata, *Pers.*
On trunks.

E. flavo-virens, *Tul.*
On hard wood.

Diaporthe, *Nitschke.*

D. pulla, *Nitschke.*
On wood.

D. incarcerata, *Berk. & Broome.*
On branches of *Rosa canina.*

D. resecans, *Nitschke.*
On branches of *Syringa vulgaris.*

Diaporthe—*cont.*

D. rostellata, *Fries.*
On stems of *Rubus fruticosus.*

D. Phillyreae, *Cke.*
On branches of *Phillyrea.*

D. circumscripta, *Otth.*
On dry branches.

D. Ryckholtii, *West.*
On trunk and branches of *Symphoricarpus racemosus.*

D. Epilobii, *Cke.*
On stem of *Epilobium montanum.*

D. Lirella, *M. & N.*
On stem of *Spiraea Ulmaria.*

Nitschkia, *Otth.*

N. cupularis, *Pers.*
On dry branches of *Tilia vulgaris* and *Robinia Pseudacacia.*

Cucurbitarieæ.

Cucurbitaria, *Gray.*

C. Berberidis, *Pers.*
On branches of *Berberis vulgaris.*

C. Aspegrenii, *Ces.*
On rotten wood.

Cucurbitaria—*cont.*

C. Laburni, *Pers.*
On branches of *Laburnum vulgare* and *L. alpinum.*

Byssosphaerieæ.

Byssosphaeria, *Cke.*

B. innumera, *Berk. & Broome.*
On dead wood.

B. Aquila, *Fries.*
On dead wood.

Lasiosphaeria, *Saccardo.*

L. sulphurella, *Saccardo.*
On fallen branches.

L. ovina, *Pers.*
On dead wood.

Venturia, *Not.*

V. Alchemillae, *Grev.*
Parasitic on living leaves of *Alchemilla vulgaris.*

Chaetomium, *Kunze*

C. elatum, *Kunze.*
On damp straw.

Psilosphaeria, *Saccardo.*

P. pulviscula, *Currey.*
On dead wood.

P. spermoides, *Fries.*
On dead wood.

P. pustula, *Currey.*
On dead wood.

Melanomma, *Saccardo.*

M. Pulvis-pyrius, *Saccardo*
On rotten wood, stumps, &c. The perithecia are very minute, and densely crowded, often covering a surface of many square inches, and resembling grains of gunpowder, hence the specific name.

Sordarieæ.

Sordaria, *Saccardo.*

S. fimicola, *Roberge.*
On dung.

Cryptosphaerieæ.

Cryptosphaeria, *Grev.*

C. millepunctata, *Grev.*
On dead branches.

Physalospora, *Saccardo.*

P. rosicola, *Fckl.*
On branches of cultivated roses.

Endophlaea, *Fries.*

E. salicella, *Fries.*
On branches of *Salix vitellina, S. alba, and S. capraea.*

E. sphingiophora, *Oudem.*
On branches of *Cornus alba.*

Leptosphaeria, *Saccardo.*

L. vagabunda, *Saccardo.*
On branches of *Hypericum calycinum & Kerria japonica.*

Metasphaeria, *Saccardo.*

M. complanata, *Tode.*
On dead herbaceous stems.

Raphidospora, *Saccardo.*

R. rubella, *Pers.*
On various kinds of dead herbaceous stems. The presence of the minute parasite is indicated by a red stain on the matrix.

Raphidospora—*cont.*

R. acuminata, *Sow.*
On dead herbaceous stems.

Heptameria, *Saccardo.*

H. arundinacea, *Sow.*
On culms of *Arundo Donax.*

H. Doliolum, *Pers.*
On dead herbaceous stems.

H. acuta, *Mont.*
On dead herbaceous stems of various plants.

H. Typharum, *Desm.*
On leaves of *Typha angustifolia.*

H. Rusci, *Wallr.*
On branches and phyllodes of *Ruscus.*

Pleospora, *Saccardo.*

P. Bardanae, *Nsl.*
On dead stems of *Arctium.*

P. Meliloti, *Rab.*
On dead stems of *Melilotus officinalis.*

P. denotata, *Cke. & Ellis.*
On dead herbaceous stems.

Pleospora—*cont.*

P. Herbarum, *Pers.*
On decaying stems of most herbaceous Dicotyledons.

Laestadia, *Saccardo.*

L. veneta, *Sacc. & Speg.*
On fallen leaves of *Platanus acerifolia.*

L. Rhodorae, *Cke.*
On dead herbaceous stems.

L. Iridis, *Cke.*
On dead leaves of *Iris Pseudacorus.*

Sphaerella, *Pers.*

S. hedericola, *Desm.*
On dead ivy leaves.

S. maculaeformis, *Pers.*
On fallen leaves of *Castanea sativa.*

S. Brassicicola, *Ces.*
On dead leaves and fruit of *Brassica oleracea.*

S. isariophora, *Desm.*
On leaves of *Stellaria nemorum & Stellaria media.*

Discomycetes.

Helvelleæ.

Morchella, *Dill.*

M. crassipes, *Pers.*
Among grass under trees. A very fine species, sometimes reaching a height of 10–14 inches. Edible. First detected at Kew by Mrs. Thiselton-Dyer. A., P.

M. esculenta, *Pers.*
Among grass in spring. Edible. A.

M. conica, *Pers.*
Among grass in spring. Edible. A.

M. smithiana, *Cke.*
Among grass. A very large showy fungus appearing in the spring. Edible. A.

Mitrophora, *Lév.*

M. Gigas, *Lév.*
Among grass in the spring. A., Q.

M. semilibera, *Lév.*
On naked soil under a hedge. In the spring. A.

Helvella, *Fries.*

H. crispa, *Fries.*
Among grass under trees in spring. Edible. A., Q.

H. lacunosa, *Afz.*
Among grass appearing in spring. A.

H. elastica, *Bull.*
Among grass in spring. A., Q.

Mitrula, *Fries.*

M. phalloides, *Chev.*

On masses of floating dead leaves in the lake.

M. cucullata, *Fries.*

On decaying pine leaves. A.

M. olivacea, *Saccardo.*

Among short grass. A.

Leotia, *Hill.*

L. lubrica, *Pers.*

Under trees. Q.

L. acicularis, *Pers.*

On decaying stumps. A.

Vibrissea, *Fries.*

V. Guernisaci, *Crouan.*

On decayed willow twigs floating in the lake.

Geoglossum, *Pers.*

G. glutinosum, *Pers.*

Among grass. A.

G. glabrum, *Pers.*

Among grass. A.

G. hirsutum, *Pers.*

Among grass. A., P.

PEZIZEÆ.

Acetabula, *Fckl.*

A. vulgaris, *Fckl.*

On the ground. A very beautiful fungus of a brownish colour, resembling a carved font in miniature. A.

Otidea, *Pers.*

O. onotica, *Fckl.*

On the ground under trees. A.

O. aurantia, *Mass.*

On the ground. A large, showy fungus, cup-shaped and usually much waved and crisped, of a clear, deep orange colour. A., Q.

Peziza, *Dill.*

P. saniosa, *Schrad.*

On the ground. A quantity of violet liquid escapes when the plant is wounded. A.

P. vesiculosa, *Bull.*

On manure heaps, rich soil, &c. Common.

P. ampliata, *Pers.*

On dead bark. Q.

P. ochracea, *Boud.*

On the ground under beeches. A.

P. badia, *Pers.*

On the ground. A.

P. bufonia, *Pers.*

On a rubbish heap. Q.

Geopyxis, *Pers.*

G. carbonaria, *Saccardo.*

On burnt ground. A.

G. coccinea, *Mass.*

On fallen branches. This fungus appears to be somewhat rare in the south of England; in the north it is a very common species, and is collected along with moss for decorative purposes. It appears during the winter and early spring. Q.

G. cupularis, *Saccardo.*

Damp ground. Q.

Humaria, *Fries.*

H. Chateri, *W. G. Smith.*

On naked ground by the sides of paths, &c. On one occasion this species was so abundant on a path in the Arboretum, that it showed as a red streak at a considerable distance away.

H. rutilans, *Saccardo.*

On the ground. A., P.

H. pilifera, *Saccardo.*

On soil in a plant-pot.

H. carbonigena, *Saccardo.*

On burnt ground. A.

H. omphalodes, *Mass.*

On burnt ground. A.

H. melaloma, *Mass.*

On burnt ground. P.

Humaria—*cont.*

H. macrocystis. *Saccardo.*
On burnt ground. P.

H. granulata, *Saccardo.*
On dung. Common.

Barlaea, *Saccardo.*

B. Constellatio, *Saccardo.*
On the ground. A.

B. Crouani, *Mass.*
On the ground among moss. A.

Curreyella, *Mass.*

C. trachycarpa, *Mass.*
On burnt ground. A.

Sepultaria, *Cke.*

S. sumneriana, *Mass.*
On the ground under pines. A.

Neottiella, *Cke.*

N. Polytrichi, *Mass.*
On the ground among moss. A.

N. corallina, *Mass.*
On the ground among moss. A., Q.

Dasyscypha, *Fries.*

D. virginea, *Fckl.*
On rotten twigs and herbaceous stems in damp places. Common.

D. nivea, *Mass.*
On damp fallen twigs. A., P.

D. bicolor, *Fckl.*
On dead oak twigs. A.

D. aspidiicola, *Saccardo.*
On dead fronds of *Nephrodium Filix-mas.* A., Q.

D. hyalina, *Mass.*
Inside fallen bark, on chips, &c. Common.

D. leucophaea, *Mass.*
On stems of dead herbaceous plants. B.

D. melaxantha, *Mass.*
On fallen branches of beech. Q.

D. corticalis, *Mass.*
On dead bark. Q.

D. dematiicola, *Mass.*
On dead rose stems. A.

Lachnea, *Fries.*

L. stercorea, *Gillet.*
On dung. Common.

L. crucipila, *Phil.*
On damp ground. P.

L. scutellata, *Gillet.*
On stumps, also on naked ground. A., Q.

L. hemispherica, *Gillet.*
On the ground under trees. A.

L. erinacea, *Saccardo.*
On rotten wood. A.

Tapesia, *Pers.*

T. fusca, *Fckl.*
On dead bark. Q.

T. aurata, *Mass.*
On dead wood. A.

T. sanguinea, *Fckl.*
On pine wood. A.

Chlorosplenium, *Fries.*

C. aeruginosum, *De Not.*
On branches of ash and oak. The wood on which this fungus grows is stained a deep verdigris-green colour, and was at one time used for the manufacture of fancy articles known as "Tunbridge ware." A., Q.

C. discoideum, *Mass.*
On an old trunk of *Robinia Pseudacacia.* The wood on which the fungus grows is stained green. A.

Sclerotinia, *Fckl.*

S. tuberosa, *Fckl.*
Parasitic on the rhizome of *Anemone nemorosa.* A destructive parasite when it finds its way into a bed of Anemones. B.

S. Galanthi, *Rehm.*
See p. 172. B.

S. Sclerotiorum, *Mass.*
On cabbage stalks. P.

Ciboria, *Fckl.*

C. pseudo-tuberosa, *Saccardo.*
On fallen, decaying acorns. A.

Cyathicula, *De Not.*

C. coronata, *De Not.*
On various kinds of dead or decaying herbaceous stems. Q.

Helotium, *Fries.*

H. claro-flavum, *Berk.*
On damp, decaying branches. Q.

H. Laburni, *Berk. & Broome.*
On branches of *Laburnum vulgare.* A.

H. lenticulare, *Fries.*
On beech trunks. A.

H. citrinum, *Fries.*
On stumps. A., B.

H. Virgultorum, *Karsten.*
On dead branches. Common.

H. cyathoideum, *Karsten.*
On dead herbaceous stems. B.

H. Herbarum, *Fries.*
On dead and damp herbaceous stems. Common.

H. renisporum, *Ellis.*
On petioles and veins of fallen oak leaves. A.

Helotium—*cont.*

H. conigenum, *Fries.*
On scales of fallen cones. A.

Belonidium, *Mont. & Dur.*

B. pruinosum, *Mass.*
On dead wood and bark; also on *Diatrype Stigma.* Q.

Mollisia, *Fries.*

M. atrata, *Karsten.*
On dead stems of various herbaceous plants. Common.

M. fusca, *Mass.*
On dead wood. A.

M. cinerea, *Karsten.*
On dead wood. Common.

M. melaleuca, *Saccardo.*
On chips. A.

Pseudopeziza, *Fckl.*

P. petiolaris, *Mass.*
On dead petioles of *Acer Pseudoplatanus.* P.

P. Ranunculi, *Saccardo.*
On dying leaves of *Ranunculus acris.* A.

Ascoboleæ.

Ascobolus, *Pers.*

A. asininus, *Mass.*
On asses' dung. P.

A. marginatus, *Mass.*
On asses' dung. P.

A. furfuraceus, *Pers.*
On horse dung. A., P.

A. immersus, *Pers.*
On goose dung. A.

Saccobolus, *Boud.*

S. violascens, *Boud.*
On rabbit dung. Q.

Ascophanus, *Boud.*

A. microsporus, *Phil.*
On rabbit dung. Q.

A. carneus. *Boud.*
On an old shoe. A.

A. equinus, *Mass.*
On horse dung. A., Q.

Ryparobius, *Boud.*

R. sexdecimsporus, *Saccardo.*
On horse dung. A.

R. argenteus, *Berk. & Broome.*
On rabbit dung. Q.

Bulgarieæ.

Bulgaria, *Fries.*

B. polymorpha, *Wetts.*
On beech trunks. Said to be a true parasite. A.

Ombrophila, *Fries.*

O. brunnea, *Phil.*
On dead herbaceous stem.

Orbilia, *Fries.*

O. inflatula, *Karsten.*
On rotten, damp wood. A.

Calloria, *Fries.*

C. fusarioides, *Fries.*
On dead nettle stems. Common.

Coryne, *Tulasne.*

C. urnalis, *Saccardo.*
On decayed stump. A., B.

C. sarcoides, *Tul.*
On rotten wood. Conidial and ascigerous stages common.

DERMATEÆ.

Cenangium, *Fries.*

C. furfuraceum, *De Not.*
On alder branches. Q.

Scleroderris, *Fries.*

S. Rubi, *Mass.*
On dead bramble stems. Q.

PATELLARIEÆ.

Patinella, *Saccardo.*

P. macrospora, *Mass.*
On rotten wood. A.

Patellaria, *Wahl.*

P. clavispora, *Berk. & Broome.*
On ash branches. A.

Patellaria—*cont.*

P. atrata, *Fries.*
On rotten floorcloth. A.

Heterosphaeria, *Grev.*

H. Patella, *Grev.*
On dead herbaceous stems. Q.

STICTEÆ.

Stictis, *Pers.*

S. radiata, *Pers.*
On hard, decorticated wood. Common.

Propolis, *Fries.*

P. rhodoleuca, *Fries.*
On scales of cones of *Pinus sylvestris.* A.

PHACIDIEÆ.

Co ccophacidium, *Rehm.*

C. Pini, *Rehm.*
On bark of *Pinus sylvestris.* A.

Schizothyrium, *Desm.*

S. aquilinum, *Rehm.*
On dead fronds of *Pteris aquilina.*

Phacidium, *Fries.*

P. multivalve, *Kze. & Schm.*
On dead holly leaves. A.

Phacidium—*cont.*

P. terrestre, *Phil.*
On rotten leaves on the ground. A.

Trochila, *Fries.*

T. Craterium, *Fries.*
On dead ivy leaves. B.

Colpoma, *Wallr.*

C. quercinum, *Wallr.*
On oak branches. A.

Xylographa, *Fries.*

X. parallela, *Fries.*
On old wood. Q.

HYSTERIACEÆ.

Hysterium, *Tode.*

H. pulicare, *Pers.*
On fallen oak bark. A.

Hysterographium, *Corda.*

H. Fraxini, *De Not.*
On fallen ash branches. A.

Glonium, *Mühl.*
G. amplum, *Duby.*
On dead bramble stems. Q.

Hypoderma, *DC.*
H. Virgultorum, *DC.*
On dead bramble stems. Q.

H. conigenum, *Cke.*
On fallen cones of *Pinus sylvestris.* A.

Lophodermium, *Chev.*
L. hysterioides, *Saccardo.*
On dead hawthorn leaves. A.

Dichaena, *Fries.*
D. quercina, *Fries.*
On living oak branches. A.

Phycomycetes.

Piloboleæ.

Pilobolus, *Tode.*
P. crystallinus, *Tode.*
On dung.

P. Kleinii, *Van Tiegh.*
On dung.

Pilobolus—*cont.*
P. roridus, *Pers.*
On dung.

P. Oedipus, *Mont.*
On dung.

Mucorini.

Pilaira, *Van Tieghem.*
P. anomala, *Schröt.*
On dung.

Mucor, *Micheli.*
M. Mucedo, *L.*
On various decaying organic substances.

M. lateritius, *Cke. & Mass.*
On rotting potatoes.

M. amethystinus, *Berk.*
On decaying bulbs.

M. pruinosus, *Berk. & Broome.*
On soil in a plant pot.

M. hyalinus, *Cke.*
On leaves of *Buxus sempervirens.*

Phycomyces, *Kunze.*
P. nitens, *Kunze.*
On fat, also on decaying seeds of *Magnolia.*

Spinellus, *Van Tiegh.*
S. fusiger, *Van Tiegh.*
On decaying Agarics.

Sporodinia, *Link.*
S. Aspergillus, *Schröt.*
On decaying fungi.

Helicostylum, *Corda.*
H. nigricans, *Van Tiegh.*
Once occurred abundantly on dead woodlice (*Oniscus*) collected in a heap under bark.

Thamnidium, *Link.*
T. elegans, *Link.*
On decaying vegetable matter.

Rhizopus, *Ehr.*
R. nigricans, *Ehr.*
On decaying fruit.

R. necans, *Mass.*
Parasitic on bulbs of *Lilium auratum*, received from Japan. In 1896 and 1897 large consignments of bulbs from Japan were completely destroyed by this fungus. For an account of its life-history *see* the *Kew Bulletin*, 1897, p. 87.

SYNCEPHALIDEÆ.

Syncephalis, *Van Tiegh.*

S. fasciculata, *Van Tiegh.*

On wet and decaying vegetable matter.

PERONOSPOREÆ.

Cystopus, *Lév.*

C. candidus, *Lév.*

On *Capsella Bursa-pastoris*, *Cheiranthus Cheiri*, *Erysimum perofskianum*, and *Pringlea antiscorbutica*. It has been found impossible to keep the last named plant in cultivation, owing to the attacks of this parasite.

C. Tragopogonis, *Schröt.*

Parasitic on *Tragopogon pratensis* and *Ipomœa*.

Phytophthora, *De Bary.*

P. infestans, *De Bary.*

Parasitic on leaves and tubers of the potato (*Solanum tuberosum*). This fungus is the cause of the destructive scourge popularly called "potato disease," although unfortunately it is not the only fungoid disease to which the potato is subject.

Plasmopara, *Schröt.*

P. pygmaea, *Schröt.*

Parasitic on leaves of various Ranunculaceous plants *Anemone*, *Aconitum*, *Isopyrum*.

P. nivea, *Schröt.*

Parasitic on leaves of species of *Aegopodium* and *Conium*.

Bremia, *Regel.*

B. Lactucae, *Regel.*

Parasitic on leaves of *Centaurea* and *Hieracium*. This fungus is often very destructive to garden lettuce, appearing on the leaves as a very delicate white film.

Peronospora, *Corda.*

P. Myosotidis, *De Bary.*

On living leaves of *Myosotis palustris* and *Symphytum tubercsum.*

P. Viciae, *De Bary.*

On living leaves of various Leguminous plants.

P. Ficariae, *Tul.*

On living leaves of *Ranunculus Ficaria*.

P. arborescens, *De Bary.*

On living leaves of *Papaver Argemone*, *P. somniferum*, also on various garden forms of poppy.

P. Violae, *De Bary.*

On living leaves of *Viola canina* and *V. sylvestris*.

P. Trifoliorum, *De Bary.*

On living leaves of *Trifolium minor*, *T. medium*, and on *Lotus corniculatus*.

P. grisea, *De Bary.*

On living leaves of *Veronica Chamaedrys*.

P. Lamii, *De Bary.*

On living leaves of *Lamium rubrum*.

P. effusa, *Rabenh.*

On *Chenopodium album*.

P. sordida, *Berk.*

On living leaves of *Verbascum Thapsus*.

P. sparsa, *Berk.*

On living leaves of cultivated roses.

Saprolegnieæ.

Leptomitus, *Agardh.*

L. lacteus, *Agardh.*
Attached to aquatic plants.

Saprolegnia, *Nees.*

S. ferox, *Nees.*
On dead flies in water.

S. elongata, *Mass.*
On decaying trunk of tree-fern in water. (*Mass Brit. Fungi*, 217, figs. 47–49.)

Pythium, *Pringsheim.*

P. de-baryanum, *Hesse.*
Parasitic and saprophytic on various plants. A destructive parasite to seedling plants, causing what is termed "damping off."

Pythium—*cont.*

P. Cystosiphon, *Lindst.*
In living fronds of *Wolffia Michelii.*

Dityuchus, *Leitg.*

D. monosporus, *Leitg.*
On decaying hyacinth bulbs.

Diplanes, *Leitg.*

D. saprolegnioides, *Leitg.*
On insects in water.

Achlya, *Nees.*

A. polyandra, *Hildebr.*
On insects in water.

Entomophthoreæ.

Empusa, *Cohn.*

E. Muscae, *Cohn.*
On dead house flies.

Entomophthora, *Fresenius.*

E. Aphidis, *Hoffm.*
On aphides.

Chytrideæ.

Synchitrium, *De Bary & Woronin.*

S. Mercurialis, *Fckl.*
On living leaves of *Mercurialis perennis.*

S. Anemones, *Woronin.*
On living leaves of *Anemone nemorosa.*

Rhizidium, *A. Braun.*

R. Westii, *Mass.*
Parasitic on *Spirogyra nitida.*

Olpidium, *Schröt.*

O. Lemnae, *Schröt.*
On the epidermal cells of *Lemna minor.*

Protomyceteæ.

Protomyces, *Unger.*

P. Menianthis, *De Bary.*
On living leaves of *Pontentilla Comarum.*

P. purpureo-tingens, *Mass.*
On leaves of seedling sunflowers. (*Mass. Brit. Fungi*, 164, figs. 72, 73.)

HYPODERMII.

Uredineæ.

Uromyces, *Link.*

U. Fabae, *Cke.*
On *Vicia Faba.*

Uromyces—*cont.*

U. Orobi, *Wint.*
On *Lathyrus macrorhizus.*

Uromyces—*cont.*

U. Polygoni, *Wint.*
On *Polygonum aviculare.*

U. Trifolii, *Wint.*
On *Trifolium repens.*

U. Geranii, *Wint.*
On *Geranium pratense.*

U. Valerianae, *Wint.*
On *Valeriana officinalis.*

U. Colchici, *Mass.*
On *Colchicum speciosum.* A destructive parasite that appeared once in the grounds, attacking every plant of the species named; and although *C. autumnale* grew on one side of the bed of diseased plants, and *C. byzantinum* on the other, neither of the last named was attacked. (*Grev.* xxi., 6, pl. 182, figs. 16–18.)

U. Poae, *Rabh.*
Aecidiospores on *Ranunculus Ficaria;* teleutospores on *Poa annua.*

U. Pisi, *Wint.*
Teleutospores and uredospores on *Pisum sativum;* aecidiospores not seen, although species of *Euphorbia* are not wanting.

U. Alliorum, *Cke.*
Teleutospores on *Allium.*

U. Ficariae, *Wint.*
On *Ranunculus Ficaria.*

U. Scillarum, *Wint.*
On *Scilla bifolia.*

U. Erythronii, *DC.*
On *Lilium candidum.*

Puccinia, *Persoon.*

P. Galii, *Wint.*
On *Galium verum.*

P. Calthae, *Link.*
On *Caltha palustris.*

P. Gentianae, *Wint.*
On *Gentiana acaulis.*

P. Silenes, *Schröt.*
On *Silene inflata.*

Puccinia—*cont.*

P. Lapsanae, *Schulz.*
On *Lapsana communis.*

P. variabilis, *Grev.*
On *Taraxacum officinale.*

P. Violae, *Wint.*
On *Viola canina.*

P. albescens, *Grev.*
On *Adoxa moschatellina.*

P. Menthae, *Pers.*
On *Origanum vulgare.*

P. Vincae, *Berk.*
On *Vinca major.*

P. Graminis, *Pers.*
Teleutospores on *Alopecurus pratensis* and *Avena elatior,* notwithstanding the great quantity of *Berberis* and *Mahonia* present in the grounds, the most careful and continued search has failed to reveal the presence of the aecidiospore stage. This is probably the most destructive fungus known, doing injury to the extent of many millions of pounds sterling every year to the wheat crop in Europe alone.

P. coronata, *Corda.*
Teleutospores on *Holcus mollis.* Aecidiospore stage not observed.

P. sylvatica, *Schröt.*
Teleutospores on *Carex remota.* Aecidiospore not seen.

P. suaveolens, *Wint.*
On *Carduus arvensis.*

P. bullata, *Schröt.*
On *Silaus pratensis.*

P. argentata, *Wint.*
On *Impatiens fulva.*

P. Hydrocotyles, *Plow.*
On *Hydrocotyle vulgaris.*

P. Campanulae, *Carm.*
On *Campanula Rapunculus.*

P. Aegopodii, *Wint.*
On *Aegopodium Podagraria.*

Puccinia—*cont.*

P. Thalictri, *Cheval.*
On *Thalictrum flavum.*

P. Veronicae, *Schröt.*
On *Veronica montana.*

P. Malvacearum, *Mont.*
On *Malva moschata* and *Althaea rosea.*

P. Circeæ, *Pers.*
On *Circaea lutetiana.*

P. Buxi, *DC.*
On *Buxus sempervirens.*

Triphragmium, *Link.*

T. Ulmariae, *Wint.*
On *Spiraea Ulmaria.*

Phragmidium, *Link.*

P. Tormentillæ, *Fckl.*
On *Potentilla Fragariastrum.*

P. violaceum, *Schultz.*
On *Rubus fruticosus.*

P. Rubi, *Schröt.*
On *Rubus fruticosus.*

P. subcorticatum, *Schröt.*
On *Rosa canina*, also on cultivated roses.

Endophyllum, *Lév.*

E. Sempervivi, *Lév.*
On *Sempervivum tectorum.*

Gymnosporangium, *Castagne.*

G. Sabinæ, *Wint.*
Teleutospores on *Juniperus Sabina.*

Melampsora, *Castagne.*

M. Lini, *Wint.*
On *Linum catharticum.*

M. farinosa, *Schröt.*
On *Salix Caprea.*

M. populina, *Lév.*
On *Populus balsamifera.*

M. betulina, *Desm.*
On *Betula alba.*

Coleosporium, *Lév.*

C. Senecionis, *Wint.*
Uredospores on *Senecio vulgaris.*

C. Sonchi, *Schröt.*
On *Sonchus oleraceus.*

C. Campanulæ, *Wint.*
On *Campanula Trachelium.*

C. Euphrasiae, *Wint.*
On *Euphrasia officinalis.*

Chrysomyxa, *Unger.*

C. Pyrolæ, *Schröt.*
On *Pyrola.*

Cronartium, *Fries.*

C. flaccidum, *Alb. & Schw.*
On *Paeonia.*

USTILAGINEÆ.

Ustilago, *Pers.*

U. longissima, *Wint.*
On *Glyceria aquatica.*

U. hypodytes, *Fries.*
On *Triticum repens.*

U. Caricis, *Wint.*
On *Carex panicea.*

U. olivacea, *Tul.*
On *Carex riparia.*

U. Scabiosæ, *Wint.*
In the anthers of *Scabiosa arvensis.*

U. Vaillantii, *Tul.*
In the anthers of *Chionodoxa Luciliae.*

Sphacelotheca, *De Bary.*

S. Hydropiperis, *De Bary.*
In the ovary of *Polygonum Hydropiper.*

Urocystis, *Rab.*

U. Colchici, *Tul.*
On *Colchicum autumnale.*

U. Gladioli, *W. G. Smith.*
On *Gladiolus.*

U. Anemones, *Schröt.*
On *Ranunculus repens.*

U. Violæ, *Berk. & Broome.*
On *Viola odorata* and *V. canina.*

Entyloma, *De Bary.*
E. Ranunculi, *Wint.*
On *Ranunculus Ficaria.*

Tuburcinia, *Fries.*
T. Scabies, *Berk.*
On potato tubers. Causing the disease known as "scab."

Doassansia, *Cornu.*
D. Sagittariae, *Schröt.*
On *Sagittaria sagittifolia.*

Thecaphora, *Fing.*
T. hyalina, *Fing.*
On *Calystegia sepium.*

Graphiola, *Poitier.*
G. Phoenicis, *Moug.*
On leaves of *Phoenix dactylifera.*

SPHÆROPSIDEÆ.

Sphærioideæ.

The majority of species included in the present family occur on leaves or herbaceous stems, some as parasites, others as saprophytes. All are very minute, and the great majority require the use of a pocket-lens for their detection.

Phoma, *Fries.*
P. Coluteæ, *Saccardo.*
On branches of *Colutea arborescens.*

P. Coronillæ, *West.*
On *Coronilla Emerus* and *Baccharis halimifolia.*

P. Sopharæ, *Saccardo.*
On *Sophora japonica.*

P. Amorphæ, *Saccardo.*
On *Amorpha fruticosa.*

P. Herminieræ, *Cke.*
On *Herminiera Elaphroxylon.*

P. rudis, *Saccardo.*
On *Laburnum.*

P. Ryckholtii, *Saccardo.*
On *Symphoricarpus.*

P. Xylostei, *Cke. & Mass.*
On *Lonicera.*

P. viventis, *Cke.*
On living twigs of *Lonicera.*

P. Beckhausii, *Cke.*
On *Viburnum Lantana.*

P. Weigeliæ, *Speg.*
On *Diervilla rosea.*

Phoma—*cont.*
P. sambucella, *Saccardo.*
On *Sambucus nigra.*

P. Landegheimiæ, *Saccardo.*
On *Philadelphus.*

P. Philadelphi, *Cke.*
On *Philadelphus.*

P. foveolaris, *Fries.*
On *Euonymus*

P. Celastriniæ, *Cke.*
On *Euonymus americanus.*

P. berberina, *Saccardo.*
On *Berberis vulgaris.*

P. Prunorum, *Cke.*
On *Prunus Laurocerasus.*

P. Pruni-lusitanicæ, *Cke.*
On *Prunus lusitanica.*

P. libertiana, *Sacc. & Roum.*
On *Larix europæus.*

P. Sorbariæ, *Cke.*
On *Spiræa japonica* and *Neillia opulifolia.*

P. Opulifoliæ, *Cke.*
On *Neillia opulifolia.*

P. Mali, *Schulzer & Sacc.*
On apple twigs.

P. ambigua, *Saccardo.*
On pear twigs.

P. Amelanchieris, *Cke.*
On *Amelanchier.*

Phoma—*cont.*

P. pusilla, *Schulzer & Sacc.*
On *Rosa canina.*

P. incarcerata, *Saccardo.*
On *Rosa canina.*

P. Viniferæ, *Cke.*
On *Vitis vinifera.*

P. diplodioides, *Saccardo.*
On *Aesculus Hippocastanum.*

P. scobina, *Cke.*
On *Fraximus excelsior.*

P. Forsythiæ, *Cke.*
On *Forsythia.*

P. aromatica, *Cke.*
On *Calycanthus occidentalis.*

P. domestica, *Saccardo.*
On *Jasminum officinale.*

P. Jasmini, *Cke.*
On *Jasminum officinale.*

P. depressa, *Lév.*
On *Syringa vulgaris.*

P. Laurella, *Saccardo.*
On *Laurus nobilis.*

P. Rhododendri, *Cke.*
On *Rhododendron.*

P. Corni, *Fckl.*
On *Cornus suecica.*

P. Barbari, *Cke.*
On *Lycium barbarum.*

P. viridarii, *Saccardo.*
On *Magnolia.*

P. stictica, *Berk. & Broome.*
On *Buxus sempervirens.*

P. cistina, *Cke.*
On *Cistus laurifolius.*

P. robergeana, *Saccardo.*
On *Staphylea pinnata.*

P. Staphyleæ, *Cke.*
On *Staphylea pinnata.*

P. Ophites, *Saccardo.*
On *Hibiscus syriacus.*

P. Exul, *Saccardo.*
On *Maclura aurantiaca.*

P. Loti, *Cke.*
On *Diospyros Lotus.*

Phoma—*cont.*

P. Tecomæ, *Saccardo.*
On *Tecoma radicans.*

P. Radicantis, *Cke.*
On *Tecoma radicans.*

P. platanoides, *Cke.*
On *Acer Pseudoplatanus.*

P. Lebiseyi, *Saccardo.*
On *Negundo aceroides.*

P. velata, *Saccardo.*
On *Tilia vulgaris,* &c.

P. Paulowniæ, *Thum.*
On *Paulownia imperialis.*

P. tamaricella, *Saccardo.*
On *Tamarix.*

P. Tamarisci, *Mont.*
On *Tamarix gallica.*

P. eleagnella, *Cke.*
On *Eleagnus.*

P. papalocystis, *Saccardo.*
On *Platanus.*

P. moricola, *Saccardo.*
On *Morus nigra.*

P. crassipes, *Cke.*
On *Broussonetia papyrifera.*

P. cinerascens, *Saccardo.*
On *Ficus Carica.*

P. juglandina, *Saccardo.*
On *Juglans regia.*

P. quercella, *Sacc. & Roum.*
On *Quercus coccinea.*

P. salicina, *West.*
On *Salix viminalis.*

P. ligustrina, *Saccardo.*
On *Ligustrum.*

P. oppilata, *Fries.*
On *Betula alba.*

P. Celtidis, *Cke.*
On *Celtis occidentalis.*

P. leucostigma, *Lév.*
On leaves of *Hedera* and *Buxus.*

P. pustulata, *Saccardo.*
On branches of *Acer palmatum.*

P. collabens, *Cke.*
On living leaves of *Prunus lusitanica.*

Phoma—*cont.*

P. Rhodoræ, *Cke.*
On *Rhododendron* leaves.

P. dispersus, *Cke.*
On leaves of *Platanus.*

P. Aucubæ, *West.*
On leaves of *Aucuba japonica.*

P. Mahoniæ, *Thum.*
On leaves of *Berberis Aquifolium.*

P. vulgaris, *Saccardo.*
On leaves of *Clematis Vitalba.*

P. Lingam, *Tode.*
On stem of *Brassica oleracea.*

P. Alcearum, *Cke.*
On leaves of *Althæa rosea.*

P. Malvacearum, *West.*
On *Malva moschata.*

P. Arctii, *Lasch.*
On *Arctium lappa.*

P. Dipsaci, *Cke.*
On *Dipsacus sylvestris.*

P. Achilleæ, *Saccardo.*
On *Achillea Millefolium.*

P. Dahliæ, *Berk.*
On *Dahlia.*

P. rubella, *Cke.*
On stems of various Umbelliferous plants.

P. Dulcamaræ, *Saccardo.*
On *Solanum Dulcamara.*

P. Tatulæ, *Cke.*
On *Datura Stramonium.*

P. Polemonii, *Cke.*
On *Polemonium coeruleum.*

P. Labiatarum, *Cke.*
On *Marrubium.*

P. Spiræœ, *Desm.*
On *Spiræa Ulmaria.*

P. Herbarum, *West.*
On *Digitalis*, *Malva*, *Aristolochia Sipho*, and *Menispermum.*

P. Polygonorum, *Cke.*
On *Polygonum cuspidatum.*

Phoma—*cont.*

P. Onagracearum, *Cke.*
On *Epilobium angustifolium* and *Oenothera biennis.*

P. oleracea, *Saccardo.*
On *Erysimum Alliaria* and *Sisymbrium austriacum.*

P. sarmenticia, *Saccardo.*
On *Menispermum canadense.*

P. Calystegiæ, *Cke.*
On *Calystegia sepium.*

P. durandiana, *Sacc. & Roum.*
On *Rumex.*

P. Lysimachiæ, *Cke.*
On *Lysimachia vulgaris.*

P. glandicola, *Desm.*
On fallen acorns.

P. Morphæ, *Saccardo.*
On stems and capsules of *Papaver somniferum.*

P. Chamaeropsis, *Cke.*
On palm petioles.

P. Acori, *Cke.*
On *Acorus Calamus.*

P. Rusci, *Saccardo.*
On stems and phyllodes of *Ruscus.*

P. nebulosa, *Fries.*
On stem of *Gentiana thibelica.*

P. Typharum, *Fckl.*
On *Typha angustifolia.*

P. pulla, *Saccardo.*
On *Hedera Helix.*

P. notha, *Berk.*
On *Platanus.*

P. planiuscula, *Saccardo.*
On *Robinia Pseudacacia* and *Ulmus campestris.*

P. Solidaginis, *Cke.*
On *Solidago.*

P. Samarorum, *Desm.*
On fruit of *Fraxinus excelsior.*

Coniothyrium, *Corda.*

C. cassiæcolum, *Cke.*
On stems of *Cassia marylandica.*

Coniothyrium—*cont.*

C. concentricum, *Desm.*

On living leaves of *Yucca*. An injurious parasite, forming large dead blotches on the leaves.

Rhabdospora, *Mont.*

R. Muggenbergii, *Saccardo.*

On branches of *Vitis vinifera.*

Diplodia, *Desm.*

D. atrata, *Desm.*

On *Negundo aceroides.*

D. Genistarum, *Cke.*

On *Genista aetnensis.*

D. Amorphæ, *Wallr.*

On *Amorpha fruticosa.*

D. cistina, *Cke.*

On *Cistus laurifolius.*

D. Roumegueri, *Saccardo.*

On *Prunus Laurocerasus.*

D. Loniceræ, *Fckl.*

On *Lonicera caprifolium.*

D. sambucina, *Saccardo.*

On *Sambucus nigra.*

D. Lantanæ, *Fckl.*

On *Viburnum Lantana.*

D. Paulowniæ, *Cke.*

On *Paulownia imperialis.*

D. Ligustri, *West.*

On *Ligustrum vulgare.*

D. laurina, *Saccardo.*

On *Laurus nobilis.*

D. Elæagni, *Pass.*

On *Elæagnus angustifolius.*

D. Celtidis, *Roum.*

On *Celtis occidentalis.*

D. Mori, *West.*

On *Morus alba.*

D. microsporella, *Saccardo.*

On *Ligustrum ovalifolium.*

D. inconspicua, *Cke.*

On leaves of *Buxus sempervirens.*

D. Magnoliæ, *West.*

On twigs and leaves of *Magnolia grandiflora.*

D. Sarmentorum, *Fries.*

On *Menispermum canadense.*

Diplodina, *Saccardo.*

D. Salicis, *West.*

On *Salix babylonica.*

D. deformis, *Karsten.*

On *Sambucus nigra.*

Hendersonia, *Berk.*

H. vagans, *Fckl.*

On *Fraxinus.*

H. Loniceræ, *Fries.*

On *Lonicera.*

H. Tiliæ, *Lév.*

On *Tilia parvifolia.*

H. ambiens, *Cke.*

On *Acer dasycarpum.*

Camarasporium, *Schultz.*

C. Berberidis, *Cke.*

On twigs of *Berberis vulgaris.*

C. Limoniæ, *Cke.*

On *Citrus trifoliata.*

C. cistinum, *Cke.*

On *Cistus laurifolius.*

C. Quercus, *Saccardo.*

On *Quercus coccinea.*

C. Mori, *Saccardo.*

On *Morus alba.*

Cytispora, *Fries.*

C. microspora, *Corda.*

On *Amelanchier.*

C. atra, *Bon.*

On *Morus alba.*

C. carbonacea, *Fries.*

On *Celtis occidentalis.*

C. Schweinitzii, *Saccardo.*

On *Salix fragilis.*

C. Salicis, *Rabh.*

On *Salix vitellina.*

C. intermedia, *Saccardo.*

On *Quercus.*

C. Platani, *Fckl.*

On *Platanus.*

C. flavovirens, *Saccardo.*

On *Acer.*

C. ambiens, *Saccardo.*

On *Fraxinus* and *Betula.*

C. Euonymi, *Cke.*

On *Euonymus americanus.*

Cytispora—*cont.*

C. Staphyleæ, *Cke.*
On *Staphylea pinnata* and *S. trifoliata.*

C. Jasmini, *Cke.*
On *Jasminum officinale.*

C. Palmarum, *Cke.*
On petioles of palm leaves.

Phyllosticta, *Pers.*

P. Paviæ, *Desm.*
On *Aesculus parviflora.*

P. sanguinea, *Desm.*
On *Cotoneaster frigida.*

P. Euonymi, *Saccardo.*
On *Euonymus europæus.*

P. tinea, *Saccardo.*
On *Viburnum Tinus.*

P. Syringæ, *West.*
On *Syringa vulgaris.*

P. Phillyreæ, *Saccardo.*
On *Phillyrea.*

P. Rhododendri, *West.*
On *Rhododendron.*

P. Arbuti, *Desm.*
On *Arbutus Unedo.*

P. Garryæ, *Cke. & Hark.*
On *Garrya elliptica.*

P. ilicicola, *Fries.*
On holly leaves.

P. Magnoliæ, var. Cookei, *Saccardo.*
On *Magnolia grandiflora.*

P. Mahoniæ, *Sacc. & Speg.*
On *Berberis Aquifolium.*

P. asiatica, *Cke.*
On *Berberis asiatica.*

P. Paulowniæ, *Saccardo.*
On *Paulownia imperialis.*

P. sidaecola, *Cke.*
On *Napæa dioica.*

P. Brassicæ, *Currey.*
On *Brassica.*

P. Epimedii, *Saccardo.*
On *Epimedium alpinum.*

P. Impatientis, *Kirch.*
On *Impatiens parviflora.*

Phyllosticta—*cont.*

P. destructiva, *Desm.*
On *Malva sylvestris.*

P. Dulcamaræ, *Saccardo.*
On *Solanum Dulcamara.*

P. Plantaginis, *Saccardo.*
On *Plantago major.*

P. Aizoon, *Cke.*
On *Sedum Aizoon.*

P. Podophylli, *Curt.*
On *Podophyllum peltatum.*

P. hydrophila, *Speg.*
On *Nymphæa alba.*

P. ruscicola, *Desm.*
On *Ruscus aculeatus.*

Asteroma, *DC.*

A. Solidaginis, *Cke.*
On *Solidago elliptica.*

A. delicatulum, *Desm.*
On *Colutea arborescens.*

Septoria, *Fries.*

S. cornicola, *Desm.*
On *Cornus.*

S. Ligustri, *Desm.*
On *Ligustrum.*

S. Chelidonii, *Desm.*
On *Chelidonium majus.*

S. Lycopi, *Pass.*
On *Lycopus europæus.*

S. Doronici, *Pass.*
On *Doronicum Pardalianches.*

S. Centaureæ, *Roum.*
On *Centaurea nigra.*

S. Aristolochiæ, *Saccardo.*
On *Aristolochia Clematitis.*

Leptostroma, *Fries.*

L. filicinum, *Fries.*
On *Pteris aquilina.*

Discula, *Saccardo.*

D. Desmazierii, *Berk. & Broome.*
On living branches of *Tilia vulgaris* and *T. platyphyllos.* The most destructive tree parasite present in the Gardens, destroying the bark and hence killing the branches of

Discula—*cont.*

the European species of *Tilia*. Several trees in the neighbourhood of Kew have been completely killed by this parasite.

Gloeosporium, *Mont.*

G. Aquilegiæ, *Thum.*
On *Aquilegia.*

G. Berberidis, *Cke.*
On *Berberis asiatica.*

G. nervisequum, *Saccardo.*
On living leaves of *Platanus orientalis* and *P. acerifolia*. A very destructive parasite, causing the leaves to fall prematurely.

Cryptosporium, *Kunze.*

C. Hippocastani, *Cke.*
On *Aesculus Hippocastanum.*

Libertella, *Desm.*

L. Rosæ, *Desm.*
On bark of *Betula alba.*

Melanconium, *Link.*

M. sphæroideum, *Link.*
On *Alnus incana.*

Melanconium—*cont.*

M. bicolor, *Nees.*
On bark of *Betula* and *Quercus.*

Cheirospora, *Fries.*

C. hedericola, *Saccardo.*
On *Hedera Helix.*

Coryneum, *Nees.*

C. cistinum, *Cke.*
On *Cistus laurifolius.*

C. umbonatum, *Nees.*
On *Ulmus* and *Quercus.*

C. notarisianum, *Saccardo.*
On *Betula papyrifera.*

Pestalozzia, *De Not.*

P. Guepini, *Desm.*
Parasitic on living leaves of cultivated species of *Camellia*, causing unsightly greyish-white blotches to appear.

Steganosporium, *Corda.*

S. cellulosum, *Corda.*
On bark of *Tilia cordata.*

HYPHOMYCETES.

Mucedineæ.

Oospora, *Wallr.*

O. fasciculata, *Sacc. & Vogl.*
On *Epilobum montanum.*

O. inaequalis, *Cke. & Mass.*
On bamboo culms.

Fusidium, *Link.*

F. griseum, *Link.*
On dead oak leaves.

Monilia, *Pers.*

M. fructigena, *Pers.*
A very destructive parasite to apples, which under its influence become spotted and unsaleable.

M. pruinosa, *Cke. & Mass.*
On fading leaves of *Caladium*.

Cylindrium, *Bon.*

C. Cordae, *Saccardo.*
On dead oak leaves.

C. flavo-virens, *Bon.*
On dead leaves of oak and beech.

Oidium, *Link.*

O. farinosum, *Cke.*
On leaves and young twigs of *Pyrus Malus*. An injurious fungus, causing the leaves to fall prematurely, consequently the fruit does not ripen properly.

O. erumpens, *Cke. & Mass.*
On living leaves of *Rivea hypocrateriformis.*

Oidium—*cont.*

O. monilioides, *Link.*
On living leaves of *Holcus lanatus.*

O. leucoconium, *Desm.*
On living leaves of cultivated roses.

O. Chrysanthemi, *Rab.*
On living leaves of cultivated varieties of *Chrysanthemum.*

O. pactolinum, *Cke.*
On living leaves of *Jasminum.*

CEPHALOSPORIEÆ.

Botryosporium, *Corda.*

B. pulchrum, *Corda.*
Overrunning stored *Dahlia* tubers.

Œdocephalum, *Preuss.*

O. Preusii, *Saccardo.*
On dead leaves of *Heuchera.*

O. sulphureum, *Cke. & Mass.*
On decaying rope.

Rhopalomyces, *Corda.*

R. elegans, *Corda.*
On decaying vegetable matter.

Trichoderma, *Pers.*

T. viride, *Pers.*
On decaying wood, moss, &c. This is considered to be the conidial condition of *Hypocrea rufa.*

ASPERGILLEÆ.

Aspergillus, *Micheli.*

A. glaucus, *Link.*
On all kinds of damp or decaying plants.

A. candidus, *Link.*
On decaying plants, fungi, &c.

Penicillium, *Link.*

P. glaucum, *Link.*
On decaying plants.

P. candidum, *Link.*
On decaying plants.

Hyphoderma, *Fries.*

H. roseum *Fries.*
On rotten wood.

Rhinotrichum, *Corda.*

R. repens, *Preuss.*
On rotten wood.

R. niveum, *Cke. & Mass.*
On old wood.

R. Bloxami, *Berk. & Broome.*
On dead wood.

Sporotrichum, *Link.*

S. laxum, *Nees.*
On rotten wood.

Sporotrichum—*cont.*

S. sulphureum, *Grev.*
On dead bark.

S. chlorinum, *Link.*
On fallen oak leaves.

Monosporium, *Bon.*

M. coprophilum, *Cke. & Mass.*
On dung.

Botrytis, *Micheli.*

B. corolligena, *Cke. & Mass.*
On fading corolla of *Calceolaria.* (*See* plate.)

B. argillacea, *Cke.*
On wood.

B. Croci, *Cke. & Mass.*
On dead leaves of *Crocus.*

B. fascicularis, *Corda.*
On dead pericarps of *Aesculus Hippocastanum.*

B. cinerea, *Pers.*
On decaying vegetable matter.

B. vulgaris, *Fries.*
On dead and also on living plants. The species of *Botrytis* are not very clearly understood; some are known to

Botrytis—*cont.*

be the conidial forms of species of *Peziza*. At all events certain kinds of *Botrytis* are very destructive parasites, more especially to bulbous Monocotyledons, lilies, tulips, snowdrops, &c., being destroyed in a wholesale manner, and as sclerotia are formed, many of which remain in the soil, it is impossible to grow these plants in succession, if the disease has once gained a footing.

B. cana, *Kze. & Schm.*
On decaying plants.

B. vera, *Fries.*
On dead herbaceous plants.

Ovularia, *Saccardo.*

O. lychnicola, *Mass.*
On living leaves of *Lychnis dioica.*

O. Berberidis, *Cke.*
On living leaves of *Berberis asiatica.*

O. Filipendulæ, *Cke.*
On living leaves of *Spiræa Filipendula.*

O. Syringæ, *Berk.*
On living leaves of *Syringa vulgaris.*

Sepedonium, *Link.*

S. chrysospermum, *Fries.*
On various decaying fungi. Said to be the conidial form of *Hypomyces chrysospermus*, Tul.

Verticillieæ.

Verticillium, *Nees.*

V. Candelabrum, *Bon.*
On rotten wood.

V. compactiusculum, *Saccardo.*
On decaying plants.

V. ampelinum, *Cke. & Mass.*
On living stem of *Vitis.*

V. lateritium, *Berk.*
On decaying herbaceous stems.

Acrostolagmus, *Corda.*

A. cinnabarinus, *Corda.*
On decaying plants.

Trichothecium, *Link.*

T. roseum, *Link.*
On dead bark, decaying fruit, &c.

T. candidum, *Wallr.*
On dead bark.

Arthrobotrys, *Corda.*

A. rosea, *Mass.*
On rotten wood.

Mycogone, *Link.*

M. rosea, *Link.*
On decaying agarics.

M. cervina, *Ditm.*
On decaying *Peziza.*

Ramularia, *Fckl.*

R. lactea, *Fckl.*
On living leaves of *Viola odorata.*

R. Hellebori, *Fckl.*
On *Helleborus fœtidus.*

R. variabilis, *Fckl.*
On living leaves of *Verbascum Thapsus.*

Helicomyces, *Link.*

H. tubulosus, *Riess.*
On rotten wood.

Coniosporeæ.

Coniosporium, *Link.*
C. Arundinis, *Saccardo.*
On *Arundo Donax.*

Coniosporium—*cont.*
C. olivaceum, *Link.*
On wood.

Toruleæ.

Torula, *Pers.*
T. monilioides, *Corda.*
On rotten wood.
T. pulveracea, *Corda.*
On rotten wood.
T. Herbarum, *Link*
On dead herbaceous stems.
T. gyrosa, *Cke. & Mass.*
On rotten pine wood.

Torula—*cont.*
T. antennata, *Pers.*
On rotten wood.
T. ovalispora, *Berk.*
On rotten wood.
T. Graminis, *Corda.*
On dead grass leaves.
T. asperula, *Saccardo.*
On damp paper.

Echinobotryeæ.

Echinobotryum, *Corda.*
E. atrum, *Corda.*
On rotten wood.

Periconieæ.

Stachybotrys, *Corda.*
S. atra, *Corda.*
On damp paper.
S. lobulata, *Berk.*
On damp paper.

Stachybotrys—*cont.*
S. asperula, *Mass.*
On damp packing paper.
S. minima, *Cke.*
On damp paper.

Arthrineæ.

Arthrinum, *Kunze.*
A. caricicolum, *Kunze.*
On dead leaves of *Carex.*

Trichosporieæ.

Trichosporium, *Fries.*
T. umbrinum, *Saccardo.*
On rotten bark.
T. fuscum, *Saccardo.*
On pine bark.

Zygodesmus, *Corda.*
Z. fuscus, *Corda.*
On rotten wood.

Monotosporeæ.

Monotospora, *Fries.*
M. sphaerocephala, *Berk. & Broome.*
On decaying vegetation.
M. repens, *Mass.*
On dead plants.

Monotospora—*cont.*
M. pumila, *Mass.*
Parasitic on *Graphium flexuosum.*
M. asperospora, *Cke. & Mass.*
On dead branches of *Clematis.*

Hadrotrichum, *Fckl.*
H. arundinaceum, *Cke. & Mass.*
On dead *Arundo conspicua.*

Acremoniella, *Saccardo.*
A. fusca, *Saccardo.*
On rotten wood.

HAPLOGRAPHEÆ.

Haplographium, *Saccardo.*
H. Chartarum, *Saccardo.*
On wet paper.

Dematium, *Pers.*
D. hispidulum, *Fries.*
On dead leaves of *Arundo Donax.*

Dematium—*cont.*
D. vinosum, *Mass.*
On damp, gummed paper.

MYXOTRICHEÆ.

Bolacotricha, *Berk. & Broome.*
B. grisea, *Berk. & Broome.*
On decaying sacking.

Myxotrichum, *Kunze.*
M. Chartarum, *Kunze.*
On damp paper.

BISPOREÆ.

Bispora, *Corda.*
B. monilioides, *Corda.*

CLADOSPORIEÆ.

Polythrincium, *Kunze.*
P. Trifolii, *Kunze.*
On living leaves of *Trifolium medium.*

Cladosporium, *Link.*
C. epiphyllum, *Mart.*
On dead leaves of various trees.
C. sphærospermum, *Penzig.*
On leaves of *Citrus.*

Cladosporium—*cont.*
C. Herbarum, *Link.*
On decaying herbaceous plants, fungi, &c.
C. nodulosum, *Corda.*
On rotten wood.
C. fasciculare, *Fries.*
On stems of *Lilium auratum.*
C. Orchidearum, *Cke. & Mass.*
On leaves of many species of cultivated orchids.

CLASTEROSPORIEÆ.

Clasterosporium, *Schw.*
C. fasciculare, *Saccardo.*
On dead wood.

Clasterosporium—*cont.*
C. Fungorum, *Saccardo.*
On the hymenium of living *Corticium molle.*

HELMINTHOSPORIEÆ.

Helminthosporium, *Link.*
H. velutinum, *Link.*
On rotten wood.
H. exasperatum, *Berk. & Broome.*
On fading leaves of *Dianthus deltoides* and other caryophyllaceous plants.

Helminthosporium—*cont.*
H. macrocarpum, *Grev.*
On dead wood.
H. fusiforme, *Corda.*
On wood.
H. apiculatum, *Corda.*
On wood.

Helminthosporium—*cont.*

H. Smithii, *Berk. & Broome.*
On dead holly.

H. densum, *Sacc. & Roum.*
On dead branch of *Morus alba.*

Brachysporium, *Saccardo.*

B. stemphylioides, *Corda.*
On dead wood.

B. apicale, *Berk. & Broome.*
On dead branches.

B. obovatum, *Berk.*
On rotten wood.

Cercospora, *Fresenius.*

C. Calthæ, *Cke.*
On fading leaves of *Caltha palustris.*

C. moricola, *Cke.*
On leaves of *Morus rubra.*

C. concentrica, *Cke.*
On leaves of *Yucca filamentosa* and *Y. gloriosa.*

Heterosporium, *Klotzsch.*

H. echinulatum, *Cke.*
On living leaves of species of *Convallaria*, *Scilla*, and *Smilax.* When abundantly developed, this species proves to be an injurious parasite, destroying the foliage.

H. Laricis, *Cke. & Mass.*
On larch leaves.

H. minutulum, *Cke. & Mass.*
On living leaves of *Chamærops humilis.*

H. Typharum, *Cke. & Mass.*
On living leaves of *Typha angustifolia.*

H. epimyces, *Cke. & Mass.*
On old specimens of *Polyporus squamosus*, *Boletus felleus*, and *Russula nigricans.*

Macronemeæ.

Stemphylium, *Wallr.*

S. asperosporum, *Cke. & Mass.*
On damp paper.

Macrosporium, *Fries.*

M. commune, *Rabh.*
On decaying plants.

M. Sarcinula, *Berk.*
On decaying *Pæonia albiflora.*

M. nobile, *Vize.*
On decaying leaves of *Dianthus.*

Macrosporium—*cont.*

M. Alliorum, *Cke. & Mass.*
On fading leaves of *Allium.*

M. Convallariæ, *Fries.*
On fading leaves of *Polygonatum multiflorum.*

Fumago, *Pers.*

F. vagans, *Pers.*
Forming sooty patches on leaves of *Ulmus campestris.*

Helicosporeæ.

Helicosporium, *Nees.*

H. viride, *Saccardo.*
On decaying birch wood.

Stilbeæ.

Stilbum, *Tode.*

S. tomentosum, *Schr.*
Parasitic on *Trichia varia.*

S. vulgare, *Tode.*
On rotten wood.

Stilbum—*cont.*

S. erythrocephalum, *Ditm.*
On rabbit dung.

S. vaporarium, *Berk. & Broome.*
On wood.

Stilbum—*cont.*

S. fimetarium, *Berk. & Broome.*
On rabbit dung.

S. turbinatum, *Tode.*
On rotten wood.

S. citrinellum, *Cke. & Mass.*
On fading leaves of *Lycopodium.*

Isaria, *Pers.*

I. citrina, *Pers.*
On decaying *Polyporus.*

Atractium, *Link.*

A. flammeum, *Berk.*
On willow bark.

Sporocybe, *Fries.*

S. atra, *Saccardo.*
On dry leaves of *Holcus mollis.*

Graphium, *Corda.*

G. graminum, *Cke. & Mass.*
On dead leaves of *Gynerium argenteum.*

G. Passerinii, *Saccardo.*
On dead stems of *Gynerium argenteum.*

G. subulatum, *Saccardo.*
On bark.

G. flexuosum, *Saccardo.*
On bark.

Stysanus, *Corda.*

S. Stemonites, *Corda.*
On rotten wood.

Arthrobotryum, *Cesati.*

A. atrum, *Berk. & Broome.*
On fallen branches.

Tuberculariеæ.

Tubercularia, *Tode.*

T. vulgaris, *Tode.*
On dead branches.

T. versicolor, *Saccardo.*
On dead branches of *Buxus sempervirens*, which were probably killed by the fungus.

T. subpedicellata, *Schw.*
On dead branches of *Syringa.*

T. Ligustri, *Cke.*
On dying branches of *Ligustrum ovalifolium.*

T. Euonymi, *Roum.*
On branches of *Euonymus europæus.*

T. expallens, *Fries.*
On dead branches of *Aesculus Hippocastanum.*

T. Aesculi, *Opiz.*
On branches of *Aesculus Hippocastanum.*

T. Sambuci, *Corda.*
On branches of *Sambucus nigra.*

T. confluens, *Pers.*
On branches of *Acanthopanax spinosum.*

Aegerita, *Pers.*

A. candida, *Pers.*
On damp elder bark.

Volutella, *Tode.*

V. ciliata, *Fries.*
On decaying *Crocus* corms.

V. Hyacinthorum, *Berk.*
On decaying hyacinth bulbs.

V. setosa, *Berk.*
On dead stems of *Lilium candidum.*

Bactridium, *Kunze.*

B. flavum, *Kunze.*
On rotten wood.

Fusarium, *Link.*

F. pyrochroum, *Saccardo.*
On dead branches.

F. viticola, *Thum.*
On branches of *Vitis inconstans.*

F. diffusum, *Carm.*
On dead thistle stems.

F. roseum, *Link.*
On decaying vegetable matter.

Fusarium—*cont.*

F. heterosporum, *Nees.*
On the inflorescence of *Holcus mollis.*

F. bulbigenum, *Cke. & Mass.*
On bulbs of *Narcissus.*

Epicoccum, *Link.*

E. vulgare, *Corda.*
On decaying herbaceous stems.

E. granulatum, *Penzig.*
On *Sorghum cernuum* and *Scirpus Eriophorum.*

E. neglectum, *Desm.*
On leaves of *Phragmites and Scirpus Eriophorum.*

Epicoccum—*cont.*

E. Herbarum, *Corda.*
On dead leaves of *Typha angustifolia.*

E. purpurascens, *Ehrh.*
On decaying stems of *Gynerium argenteum.*

Myrothecium, *Tode.*

M. roridum, *Tode.*
On decaying vegetable matter.

M. inundatum, *Tode.*
On decaying *Boletus luridus.*

Exosporium, *Link.*

E. Tiliæ, *Link.*
On bark of *Tilia vulgaris.*

APPENDIX.

MYXOGASTRES.

A very beautiful group of organisms, remarkable alike for beauty of form, brilliancy of coloration, and their remarkable life-history. Most of the species are minute, and are not uncommon on rotten wood, moss, &c. There is a difference of opinion as to the affinities of this group, which by some authorities is considered as related to Fungi, whereas others place it in the Animal Kingdom. Coloured figures, along with descriptions of all the British species, are contained in "A Monograph of the Myxogastres." Twenty-five genera and fifty species have been collected in the grounds, just about half the number known to occur in Britain.

TUBULINEÆ.

Tubulina, *Pers.*

T. cylindrica, *Rost.*
On dead wood.

T. effusa, *Mass.*
On rotten wood.

Enteridium, *Rost.*

E. olivaceum, *Rost.*
On stumps.

CRIBRARIÆ.

Cribraria, *Pers.*

C. intricata, *Schrad.*
On rotten wood.

C. argillacea, *Pers.*
On wood.

Dictydium, *Schrad.*

D. cernuum, *Nees.*
On rotten wood.

STEMONITEÆ.

Stemonitis, *Gled.*
S. fusca, *Rost.*
On rotten wood.
S. typhina, *Mass.*
On rotten wood.
S. friesiana, *De Bary.*
On dead leaves.

Brefeldia, *Rost.*
B. maxima, *Rost.*
On fallen trunks.

Reticularia, *Bull.*
R. Lycoperdon, *Rost.*
On wood and bark.

LAMPRODERMEÆ.

Lamproderma, *Rost.*
L. violaceum, *Rost.*
On living *Hypnum.*
L. irideum, *Mass.*
On dead leaves.

Lamproderma—*cont.*
L. arcyrioides, *Rost.*
On rotten wood.

ARCYRIEÆ.

Perichæna, *Fries.*
P. corticalis, *Rost.*

Lycogala, *Micheli.*
L. epidendrum, *Rost.*
On fallen trunks.

Prototrichia, *Rost.*
P. cuprea, *Mass.*

Arcyria, *Hill.*
A. punicea, *Rost.*
On rotten wood.
A. incarnata, *Rost.*
On dead bark.
A. nutans, *Rost.*
On rotten wood.
A. cinerea, *Mass.*
On dead wood.

TRICHEÆ.

Oligonema, *Rost.*
O. nitens, *Rost.*
On dead bark.

Trichia, *Haller.*
T. fragilis, *Rost.*
On dead wood.
T. varia, *Rost.*
On dead moss.

Trichia—*cont.*
T. abrupta, *Cke.*
On dead wood.
T. scabra, *Rost.*
On dead wood.
T. fallax, *Rost.*
On rotten wood.

DIDYMEÆ.

Chondrioderma, *Rost.*
C. floriforme, *Rost.*
On mosses.
C. difforme, *Rost.*
On dead hawthorn leaves.

Didymium, *Schrad.*
D. farinaceum, *Schrad.*
On living moss.
D. squamulosum, *Fries.*
On dead leaves.

Didymium—*cont.*

D. microcarpon, *Rost.*
On dead leaves.

D. Clavus, *Rost.*
On dead twigs.

D. Serpula, *Fries.*
On dead oak leaves.

Lepidoderma, *De Bary.*

L. tigrinum, *Rost.*
On rotten wood.

Spumaria, *Pers.*

S. alba, *DC.*
On living grass.

Diachæa, *Fries.*

D. leucopoda, *Rost.*
On dead leaves.

PHYSAREÆ.

Craterium, *Trent.*

C. confusum, *Mass.*
On dead grass.

C. aureum, *Rost.*
On dead bark.

Physarum, *Pers.*

P. leucopus, *Rost.*
On dead wood.

P. leucophæum, *Fries.*
On dead twigs and moss.

P. cinereum, *Rost.*
On dead twigs.

P. contextum, *Rost.*
On bark and moss.

P. cerebrinum, *Mass.*
On wood and soil in a pot containing palm-seeds from Java. Probably an introduced species. (*Monogr. Myx.*, p. 306, fig. 275.)

Badhamia, *Berk.*

B. macrocarpa, *Rost.*
On dead bark.

B. panicea, *Rost.*
On twigs.

B. varia, *Mass.*
On wood.

Tilmadoche, *Rost.*

T. nutans, *Rost.*
On rotten wood.

Leocarpus, *Rost.*

L. fragilis, *Rost.*

Fuligo, *Rost.*

F. varians, *Rost.*
On heap of dead leaves.

DLIV.—SPINDLE TREE.

(*Euonymus europæus*, L.)

Inquiries are sometimes directed to Kew as to the manufacture of skewers from spindle-wood. The following interesting particulars respecting this charming British shrub are therefore reprinted from the *St. James's Gazette* for November 7 last.

The spindle tree (*Euonymus europæus*) is one of our native shrubs or small trees possessing great ornamental merit which are overlooked by landscape gardeners. It is deciduous, but its broadly lanceolate leaves of a wavy irregular outline, with minutely serrated edges, turn, before they fall, to a deep rich crimson. The small pale-green cross-like

blossoms, which open in May, are inconspicuous; but the fruit when ripe in October has all the appearance of a flower of brilliant hues. The fruit, indeed, from its colour and shape, is the most distinctive as well as most beautiful feature of the tree. Each berry is four-lobed and of a lively rose-pink. When quite ripe the lobes open, disclosing four large seeds covered with a deep orange-coloured membrane, the seeds and the husk then presenting a curious but attractive contrast. The wood of the spindle tree is exceedingly tough; and the husks and stems of the berries partake of the same character, so that long after the leaves have fallen these remain to enliven the wintry landscape. Birds will not touch them, and with human beings they act as a strong emetic and purgative.

The wood is so compact and tough that it is hard to break and almost impossible to splinter. In the days of domestic industries, when every notable maid minded her wheel, it was in request for the making of spindles; hence its commonest name—a name by which it is known in Germany and Italy. It was also used for making the pointed ends of ox-goads; whence is derived another name of gatter tree, or prickwood. Chaucer calls the berries gaitre-berries, and in the Nonnes Preestes Tale recommends them against ague and the humours.* In Ireland it is called pegwood, because shoemakers use it for pegs for shoes. In France it is also known by the name of priest's cap, from the resemblance of the berry in shape to a biretta. Though goads and spindles are gone out of fashion, the wood is still employed in the making of a variety of small wares—such as skewers, toothpicks, and fine pins for cleaning watches; and artists are said to prefer the charcoal prepared from the branches to any other, partly from its excellent quality and partly because it is easily effaced.

The spindle tree is easily propagated either from seed or from cuttings. It seems to prefer a chalky soil and a mild climate, and consequently flourishes best in the southern counties of England. It is said to be rare in Wales; in Scotland it is almost unknown. A variety of the common spindle tree, bearing berries with white instead of pink husks, is occasionally found; but although the contrast between the white husks and the orange seeds is curious, the effect is less pleasing than that presented by the berries of the commoner sort.

DLV.—MISCELLANEOUS NOTES.

Retirement of Sir Robert Meade, G.C.B.—The disappearance from official life of one who for a quarter of a century has shown the keenest interest in colonial enterprise, and has been continually in communication with Kew in endeavouring to advance it, cannot be passed over without a few words of remembrance. The Hon. Sir Robert Meade, after a varied official career became Assistant under Secretary to the Colonial Office in 1871 and Under-Secretary of State in 1892. He retired on February 28th of the present year.

The assistance which Kew can afford to the Colonies is somewhat difficult to render on ordinary official lines. Plants can neither be transmitted nor treated afterwards by the same mechanical procedure as ordinary Government stores. Economic questions cannot always be

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* Chaucer's plant is, however, generally supposed to be the Dogwood (*Cornus sanguinea*, K.).

dealt with on official foolscap. Sir Robert Meade never failed to take a human view of possibilities, and many things were accomplished accordingly which any other method would have made impracticable. A strong personal taste for botany and gardening made him keenly alive to the difficulties and limitations of any aid which could be given effectively to cultural industries in the Colonies. Judicious vigour led him to clear away unnecessary difficulties in assisting any reasonable project. How much the Colonies owed, in this respect, to his unfailing attention to their welfare can never, perhaps, be wholly appreciated.

Death of Sir John Thurston, K.C.M.G.—After 20 years' service in various capacities in the Pacific Sir John Thurston became Governor of Fiji and High Commissioner in the Western Pacific in 1887. He died in February last while still in office. His career was one of those which counts for little in the public eye; yet it was spent in capable and unflinching service on behalf of the Empire. So intimate was his knowledge and so self-sacrificing his devotion to its affairs in the Pacific that his very indispensableness barred his further career in the Colonial service. A correspondence with Kew, begun some 20 years ago, was ever after maintained with unflagging vigour. Although not a scientific man himself Sir John was keenly interested in the Pacific flora, and Kew owes to him many new species which he successfully transmitted to it. The Colony he ruled so long was an object to him of almost parental affection, and his letters to Kew are a continuous record of his efforts to promote its material development.

Seed Distribution.—The following is a statement of the number of packets of seeds distributed from the Royal Gardens during 1896–7 (December 1 to March 31) to other Botanic Institutions at home and abroad:—

Hardy herbaceous plants - - -	7223
Ligneous plants - - -	3018
Various (mostly tropical) - - -	457
	10,698

Botanical Magazine for March.—The present number opens with a figure of the magnificent *Wistaria chinensis* var. *multijuga*, which has racemes exceeding two feet in length. It is a native of Japan, and was sent to Kew by Van Houtte, of Ghent, in 1874. *Holothrix orthoceras*, a South African species, flowered in the Royal Gardens in March of last year, tubers having been received from Mrs. Deglon, of Barberton. The figure of *Grevillea hilliana* was prepared from a specimen sent to Kew by Thomas Hanbury, Esq., of La Mortola. It is a native of Eastern Australia. *Dendrobium sarmentosum* from Burma was received from Mr. C. Curtis, F.L.S., Superintendent of the Botanic Gardens and Plantations of Penang. The flowers are violet-scented. *Didymocarpus malayana* is a new species, probably native of Penang, sent to Kew by Messrs. J. Veitch & Sons, of Chelsea.

Flora of British Central Africa.—The handsome and scholarly monograph on British Central Africa, which has been published by Sir Harry Johnston, late Her Majesty's Commissioner and Consul-General for that region, stands out in marked contrast to the bulk of the ordinary ephemeral geographical literature of the day. Apart from the interest imparted to it by the robust common sense and lively personality of its author, it gives a singularly vivid picture of one of the most important of our African possessions. But it must always remain a standard book of reference on the subject, if only for the pains with which its author has included in it the most accurate information which he could procure on every branch of the natural history of the territory under his charge; and he had moreover spared no pains to have the collections made on which the reports are drawn up.

Kew willingly consented to his request for a list of the plants known to occur in British Central Africa from the materials preserved in the Herbarium of the Royal Gardens. This was accordingly prepared by Mr. I. H. Burkill, M.A., one of the scientific staff. It occupies pages 233–284.

The following introductory note gives some account of the collections upon which it is based.

"The following list, compiled for the most part from the plants and manuscript records in the Herbarium of the Royal Gardens, Kew, must be regarded as provisional. The knowledge of the flora of the British territory north of the Zambezi has been so rapidly extended during recent years, and is yet so imperfectly known, that any account approaching completeness is at present impossible. Little has been published hitherto, and the facts now collected together will serve to bring into one view nearly all we know of the Botany of British Central Africa.

"The first collections were made by two members of the Livingstone Expedition in the years 1861, 1862. Dr. (afterwards Sir) John Kirk and Mr. J. C. Meller, while exploring the course of the Shire River and wandering in the Mañanja hills, made considerable collections, which were transmitted to Kew, some of them in time for description in the *Flora of Tropical Africa.* Subsequently Dr. Kirk journeyed up the Zambezi into the Batoka country, from the highlands of which and from the region of the Victoria Falls other plants were sent home. The new species gathered by him were described in a variety of different publica, tions. In the following years Mr. Horace Waller, residing in the Mañanja hills, continued to transmit plants to Dr. Kirk, who was at that time Her Majesty's Consul in Zanzibar. After this comes a gap of some years in which nothing was added to our knowledge, until Dr. Emil Holub in 1879, returned from a journey during which he had made considerable collections. Of these, a few of the plants had been gathered about Sesheke, almost the most northern point which he reached, and within the territory under consideration. At the same time (1878) Major Serpa Pinto made, in his journey across the continent, a small collection on the table-land over the River Ninda, and the plants of this were, in 1881, described in the *Transactions of the Linnean Society.* Again in this year, 1878, the late Mr. John Buchanan sent to Kew his first collection of Nyasaland plants, and Mr. L. Scott travelled collecting through the Shire Highlands to the head of Lake Nyasa.

"From this date our knowledge has steadily grown. Under the influence and with the help of Sir Harry Johnston, the region of the Shire Highlands has been energetically explored. The frequent mention below of the names of J. Buchanan, G. F. Scott-Elliot, J. McClounie,

J. Last, A. Whyte, and K. C. Cameron shows how much has been done in this region. Further north, in 1879, Mr. Joseph Thomson had gathered plants on the Nyasa-Tanganyika plateau, and these reached Kew in 1880. Messrs. Carson, Nutt, Scott-Elliot, and Sir Harry Johnston have also collected on the plateau, and the first-named on a journey along the Kalungwesi River to Lake Mweru.

" The collection made at Boroma, on the north of the Zambezi, by the Rev. L. Menyharth, is only in part known.

" As a guide to the distribution, the region has been divided into four sections, as follows :—

1. Shire Highlands.
2. Nyasa-Tanganyika plateau; some of the plants probably collected on the German side of the boundary line.
3. Extreme west, where Major Serpa Pinto alone has collected.
4. Upper Zambezi.

" It must be understood that all the plants collected by Buchanan were obtained in the Shire Highlands; all by Carson and Nutt, unless otherwise stated, from the region near the south end of Lake Tanganyika; all from Serpa Pinto from the one plateau near the River Ninda; and all from Menyharth from Boroma. It was not thought necessary to repeat these localities with the collectors' names."

Drift Seeds from the Keeling Islands.—Mr. H. N. Ridley, Director of the Gardens and Forest Department, Straits Settlements, has presented a small collection of drift seeds from the Keeling or Cocos Islands, made by Mr. G. C. Ross, the present lessee of the islands. It contains little that has not been collected before under the same conditions, but it may be worth while putting the names on record. They are:— *Carapa moluccensis*, Lam., three or four species of *Mucuna*, *Erythrina indica ?*, *Cynometra cauliflora*, L., *Cæsalpinia Bonducella*, Fl., *Entada scandens*, Benth., *Barringtonia*, *Terminalia Catappa*, L., *Hernandia*, three or four species of *Quercus*, *Aleurites triloba*, Forst., and *Cycas circinalis*, L.

Algæ in the Kew Herbarium.—The re-arrangement and cataloguing of the Algæ in the Kew Herbarium will greatly facilitate reference to this extensive and valuable collection. For the sake of convenience the classification and nomenclature adopted are those of De Toni's *Sylloge Algarum*, and in this book the numbering of all the species consecutively is of considerable advantage for cataloguing purposes.

An especial value and interest attach to the Kew collection of Algæ on account of the large number of original specimens received at first hand from the old pioneers of algology, as well as from later and recent authorities. Foremost among these stands the type collection of Dawson Turner, mostly mounted on glass slips and enclosed in envelopes labelled in his own handwriting. To this must be added the numerous type specimens of Robert Brown, Stackhouse, Greville, Harvey, and others of our own countrymen; whilst the rich herbaria of the Hookers father and son, of Berkeley, and of Mrs. Griffiths furnish abundant material from the older continental authorities, supplemented by the more recent exsiccatæ of Rabenhorst, Hauck, Wittrock, and Nordstedt, and the contributions of the veteran J. G. Agardh.

It is not generally known that on the shelves of the Kew Library are to be found a series of volumes of coloured drawings by Miss Turner, Miss Hutchins, Carmichael, Dawson Turner, and others. These drawings are executed with great skill, and being in most cases accompanied by manuscript descriptions, present a mine of unworked material for future students of British algology.

The catalogue which is being prepared gives the locality and collector's name for every specimen in the herbarium, so that a preliminary glance at this list will show how far any particular species is represented, and on whose authority.

Broom Root.—An account of Broom root or Mexican whisk obtained from one or more species of grasses belonging to the genus *Epicampes* was given in the *Kew Bulletin* for December 1887 (p. 9). The roots in the condition in which they are exported are known as "Raiz de Zacaton." During some years very little has been exported, but latterly increased interest has been taken in them as a cheap substitute for the well-known Venetian whisk, derived from the roots of *Chrysopogon Gryllus*. The most recent information respecting Broom root is contained in the following 'Report for the year 1895 on the Trade of Mexico' (F.O., 1896, Annual Series, No. 1827):—

"From the roots of a coarse tufty grass, known as "Zacaton," which is found growing wild all over the highlands of Mexico, a fibre is extracted called "Raiz de Zacaton," which has found a market abroad for the manufacture of certain kinds of brushes and whisks. It is collected by hand, and is subjected to very little treatment before being baled, beyond being soaked in water and bleached in the sun. The principal market for this fibre is Hamburg, but the United States and France both take a certain amount. It has never obtained a foothold in the English market. The export in 1895 was valued at 67,599*l*. The price, according to the New York quotations, ranged in the year under question from 6c. to 14c. per lb., according to quality."

Snowdrop Disease.—Snowdrops are liable to be affected with a disease caused by a fungus (*Sclerotinia Galanthi*). The following treatment is recommended for keeping it in check:—

Spray at intervals of three days with a dilute solution of Bordeaux mixture*, or a rose-red solution of Condy's fluid. Do not spray when the sun is shining. This will arrest the spread of the fungus, but will not cure those plants already attacked. A white mould, or *Botrytis* stage of the fungus, originates from very minute sclerotia or resting stages, formed in the bulbs of the previous season. These sclerotia germinate, grow up the flower stalk, and produce their crop of spores in the air. These, in turn, germinate on the ground, grow down to the bulbs and attack those that are healthy, forming sclerotia which will in the following season produce the *Botrytis* form. The great point is to destroy the white mould, and thus prevent healthy bulbs from becoming infected.

G. M.

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* See *Kew Bulletin*, 1889, p. 229.

A Canna Disease.—A dangerous disease, by which species of *Canna* are quickly destroyed, was first recorded from San Paulo, in Brazil, in 1884. Quite recently an account of the destruction of Cannas, by what proves to be the same fungus, *Uredo Cannæ*, Winter, has been received from Mr. J. H. Hart, Superintendent of the Botanic Gardens, Trinidad. Diseased leaves are at first thickly studded with minute, yellowish spots; this appearance is quickly followed by blackening and death. The disease does not appear to have reached Europe as yet, and great care should be exercised in receiving living plants from the New World, as the fungus, which is a close ally of the Hollyhock rust, *Puccinia Malvacearum*, if once introduced, would, in all probability, render impossible, for a time at least, the cultivation of Cannas.

Double Rice.—In the *Proceedings of the Asiatic Society of Bengal* for April 1895, Dr. D. Prain describes and figures what is known in India as Double Rice. In all cases the phenomenon was found to be due to an increase in the number of ovaries, the other parts of the flower being invariably of the normal number. In the gynæceum of over 150 flowers examined not one was found with fewer than four ovaries, all apparently perfect; the usual number being five. A few flowers were found to have six, and one or two had seven ovaries. When five, six, or seven ovaries were present, sometimes only three, but usually four or five appeared to be perfect. The ovaries may be one-, two-, or three-styled. Usually only two ovaries develop into grain, sometimes three, and their shape is modified accordingly.

Sorghum Sugar.—The Sugar Sorghum or Broom Corn (*Andropogon Sorghum*, Brot., var. *Saccharatus*, Koern., is a grass largely cultivated in Northern India, China, and Japan, as well as in the United States. It is, however, native of none of these countries, and its original home is obscure, but is probably Tropical Africa. For many years past a strenuous effort has been made in North America to utilise the sugar sorghum as a source of sugar in a zone north of that in which the sugar cane is grown. The result has not, however, been very successful, as the sugar can only be obtained for the most part in an uncrystallizable form. Syrup is, however, a large article of consumption in the United States, and this alone affords the industry a chance of success.

The following extract from *The Louisiana Planter* for December 1, 1894, gives what is no doubt a correct account of the industry from an American point of view.

" *The Sorghum Industry.*—Sorghum manufacture consists in making syrup and also sugar. It is a common error to measure the sorghum industry simply by its yield of sugar. The value of the sorghum syrup product of the country is greater than the value of the sorghum sugar. In small factories syrup only is produced, and in large factories syrup, sugar, and molasses are produced. The sorghum crop is of sufficient importance in twenty-four States to be reported monthly by the government statistician, along with sugar cane, rice, wheat, corn, and other leading crops of the country.

" The season for sorghum manufacture usually begins in August. At that season sugar cane syrup is not found in market. There is, then, a general demand for 'new crop syrup.' At the beginning of the season

the syrup factories find a home market for their product, and the sugar factories use quantities of cane which is not fully ripe in the manufacture of syrup.

"The beet sugar factories and the sorghum sugar factories have a considerable advantage in the fact that there is usually an active demand for sugar in the months of August and September for use in preserving fruits. As a rule sugar brings a higher price in those months than it brings in the months in which Louisiana sugar is marketed. And sorghum has an advantage over beet manufacture in the fact that it is possible to make a fine sorghum syrup during the months when the market is bare of syrup, or whenever syrup pays better than sugar. Sugar refiners utilise a part of the residues of sugar refining by converting them into syrup, and it is said that there is sometimes more profit in the syrup made from the residues than in the refined sugar, for the reason that syrup sometimes brings a relatively higher price than sugar. It seems probable that, for a time, the production of fine, uncrystallizable syrup will form a considerable part of the output of sorghum sugar factories, and that only the best cane which alone is profitable for sugar manufacture will be worked for sugar, and that unripe canes at the beginning of the season, inferior cane during the season, and frosted cane at the end of the season, will be worked for fine syrup, as the inferior residues of sugar refining are worked for fine syrup. So far the sorghum sugar factories have worked mainly for raw sugar, and incidentally for crude syrup. The result has been a small yield of sugar per ton of cane worked for sugar, a large yield of molasses which includes a considerable amount of sugar which cannot be extracted profitably, and inferior syrup which requires the manipulations of the 'mixers' to fit it for use. It is not difficult to make a fine uncrystallizable syrup from sorghum, which is superior for many purposes, if not for all, to the common mixed syrups. Considering the immense sale of mixed syrups, there seems to be room for a syrup which can be produced at a low cost, and which is superior to the mixed syrups. There seems to be little profit in producing an inferior quality of syrup, which is wanted only by mixers, as there is little profit in producing articles of low grade in any line.

"At present it is much easier to improve the manufacture of syrup than it is to immediately improve the extraction of sugar from molasses. The latter is a problem which long troubled sugar cane and beet sugar manufacturers, and it requires time for the sorghum industry to work out that problem, as it required time in the sugar cane and the sugar beet industries. While an increase in sugar yield is and should be the main object of the sorghum sugar factories, yet while accomplishing that object is seems necessary to utilise the cane in the best possible way with regard to immediate financial results.

ROYAL GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

Nos. 125–126.] MAY and JUNE. [1897.

DLVI.—INSECTS DESTRUCTIVE TO CULTIVATED PLANTS IN WEST AFRICA.

One of the difficulties inseparable from the work of opening plantations in new countries is the injury done to cultivated plants by various insects. In a state of nature these feed on the wild plants of the country and their attacks pass unnoticed. When, however, the indigenous forest is cut down to give place to regular plantations it is found that the insects whose food supply has been destroyed attack the introduced plants and cause considerable loss. This is inevitable under the circumstances, and is a part of the penalty which the planter has to pay for interfering with the balance of nature.

In West Africa the attacks of insects have of late been more than usually destructive. Numerous economic plants introduced for experimental cultivation at the Aburi Botanic Station, on the Gold Coast, have been almost entirely destroyed, while the newly established coffee plantations in the colony of Lagos have also suffered. Owing to the difficulty of obtaining satisfactory material and securing observations by skilled observers on the spot, it has not been possible hitherto to do more than offer suggestions for further inquiry and a trial of methods found useful in dealing with the attacks of allied insects in other countries.

At the instance of the Government of the Gold Coast, an inquiry has been undertaken on behalf of Kew by Mr. Walter F. H. Blandford, F.Z.S., F.E.S., with the view of identifying some of the insects, and of affording technical assistance in dealing with future attacks.

The correspondence which has led to the inquiry and Mr. Blandford's reports are detailed below. The information contained in these documents cannot fail to be of value to those who are engaged in cultural operations in West Africa :—

Colonial Office to Royal Gardens, Kew.

Downing Street,
August 29, 1896.

Sir,

I am directed by the Secretary of State for the Colonies to transmit to you the accompanying copy of a despatch, with enclosures, from the Officer administering the Government of the Gold Coast, respecting the borers which infest some of the economic plants in the Botanical Station at Aburi.

I am to state that the Secretary of State will be obliged if you will be good enough to advise him as to the best method of dealing with these insects.

The Crown Agents for the Colonies have been instructed to forward to you the box of specimens mentioned in the despatch.

I am, &c.
(Signed) JOHN BRAMSTON.

The Director,
Royal Gardens, Kew.

ADMINISTRATOR of the GOLD COAST to COLONIAL OFFICE.

Government House, Accra,
July 18, 1896.

SIR,

I HAVE the honour to report that in consequence of the statements made by the Chief Justice, Mr. Brandford Griffith, in a letter addressed to Governor Sir William Maxwell, of which I enclose an extract, His Excellency requested the Chief Medical Officer to visit Aburi and make a report upon the condition of the coffee shrubs and rubber trees.

2. It was not, however, until last month that Dr. Easmon found himself in a position to leave Accra. I enclose a copy of his report which reached me on the 26th ultimo, and I am sending separately by this mail, addressed to the Crown Agents, a box containing—

(*a*) specimens of borers; and
(*b*) specimens of coffee trees showing the action of the borers upon them.

3. I have the honour to ask that Dr. Easmon's report and the specimens may be sent to the Director of the Royal Gardens, Kew, who will no doubt give his valuable advice as to the best method of combating and getting rid of the pest.

4. Mr. Humphries, the curator of the Botanic Station, who, I may say, afforded Dr. Easmon every assistance, is now, as you are aware, in England on leave of absence.

I have, &c.
(Signed) F. M. HODGSON,
Administrator.

The Right Honourable
J. Chamberlain, M.P.,
&c. &c. &c.

EXTRACT from a LETTER, dated Aburi, 6th January 1896, from the CHIEF JUSTICE to the GOVERNOR.

I came up here on Saturday, and on Sunday morning I looked round the Coffee. It is in a deplorable state. The Arabian coffee apparently likes the soil and climate, but is literally ruined by (I think) a boring grub, which enters near the bottom and makes a hole rootwards, thereby doing fatal injury to the trees. Practically all the Arabian coffee looks wretched. I never saw anything looking better than the Liberian coffee. It looks superb. On closer investigation I found about two trees out of five attacked by a boring grub, different, I think, from the grub which attacked the Arabian coffee. This grub has only lately begun to attack the Liberian coffee, and you can see trees laden and

breaking down with fruit getting yellow from the effects of the grub; some are dying, some dead, all due to the boring grub. The natives see or will soon see it, and will abstain from planting coffee. Considering that this is an agricultural country, and that soil and climate appear to suit the Liberian coffee to perfection, something should be done to try and defeat the grub.

REPORT by DR. EASMON on some of the BORERS affecting some of the Economic Plants in the Government Botanic Station at Aburi.

1. *Borer affecting the Arabian Coffee.*

Specimens preserved:—

(*a.*) Portion of cocoon showing its tough and fibrous nature;
(*b.*) A full-sized grub or larva;
(*c.*) A pupa; and
(*d.*) A mature insect.

The larva is two inches long, greenish white in appearance with a darker grey streak along the sides; the head is large and provided with two strong brown nippers; the body consists of 11 segments, the two nearest the head being only slightly distinguishable.

Only a portion of the pupa is given; it calls for no special remark.

The developed insect is one inch in length; narrow body of a light brown colour; the head is black, on the centre of the back is a black triangular mark with the apex pointing backwards and on each side, about a quarter of an inch from the posterior extremity, are two smaller black marks. The antennæ are retracted over the back. This insect is very active in its habits.

2. *Borer affecting the Liberian Coffee.*

This is morphologically practically the same insect as that affecting the Arabian coffee; the matured insect seemed a trifle larger than the others and perhaps darker in colour, but I think this is simply a question of age or possibly of sex.

3. *The* Castilloa elastica *Borer.*

Specimens of this insect in various stages are supplied in two tubes.

The grub is much larger than in the preceding cases, and the matured insect is also larger, measuring $1\frac{1}{4}$ inches in length and much broader than the coffee borer. The antennæ are an inch and a half long and retracted over the body; the colour of this beetle is of a darker grey tint, with two small black points on either side of the middle line in the centre of the back, and black spots on the outer side of the body, as in the list described. This insect is most active in its operations.

4. *Orange and Lemon Trees.*

Two classes of borers affect these plants, one attacking them at the roots, the other at the branches. It would appear that the operations of the latter are dependent upon those of the former, and that as a matter of fact they are inoperative until a certain degree of diminished vitality of the wood is reached.

The root borers are particularly active, and the larva has special morphological arrangements for facilitating its operations. Specimens of all the insects I found on these trees are submitted.

(Signed) J. FARRELL EASMON.

ROYAL GARDENS, KEW, to COLONIAL OFFICE

Royal Gardens, Kew,
SIR, June 29, 1897.

WITH reference to your letter of the 29th August last, No. 17,220/96, and subsequent correspondence, I have the honour to forward herewith a copy of the report prepared by Mr. Walter F. H. Blandford, F.Z.S., on the insects injurious to plants at the Botanic Station at Aburi, on the Gold Coast.

2. The preparation of this report has, I regret to state, been unduly delayed by Mr. Blandford's engagement on the Natal Tsetse fly inquiry. The results of the investigation as now presented cannot, however, fail to be of considerable value on the Gold Coast, and as some of those destructive insects are widely distributed in West Africa, they will be of service in other colonies where coffee, india-rubber, orange, and other trees are now being cultivated.

3. Under these circumstances you may consider it desirable to communicate a copy of the report to the Governors of the other Colonies in West Africa in addition to the Governor of the Gold Coast, for whom it has been specially prepared. The small parcel sent herewith containing some of the insects named and mounted should also be sent to the Gold Coast, to be kept there for future reference.

4. It will be noticed that Mr. Blandford indicates somewhat technical lines of inquiry and methods of treatment. In the first instance these should be carefully studied and applied by the curators of the botanic stations, and the results of their observations might be placed on record for the information of persons engaged in cultivating economic plants, in occasional bulletins or in the annual reports of the stations

I am, &c.,
(Signed) W. T. THISELTON-DYER.

Sir JOHN BRAMSTON, K.C.M.G., C.B.,
Colonial Office, S.W.

REPORT by MR. WALTER F. H. BLANDFORD on INSECTS injurious to Coffee, &c., from Aburi.

MATERIAL RECEIVED.

The material received from Aburi consists of insects in various stages, preserved in spirit, and of samples of coffee shrubs, &c., which have been injured by them. Accompanying the material is a short report by Dr. J. Farrell Easmon, Chief Medical Officer.

It may be stated at once that the material and information supplied are insufficient to furnish the basis of a detailed report and fully set forth the measures to be adopted to relieve the plantations of these pests. In the case of, say, European insects of which the habits are tolerably well known, a mere identification of an injurious species is often sufficient to enable a line of treatment to be suggested.

In the case, however, of exotic insects it is only rarely that evidence other than that actually supplied with the specimens is available, and the utmost that can be done is to advise on general grounds, pointing out the direction which further inquiry should take, and the line of treatment which such inquiry, if it lead to a positive result, may suggest. This is all that can be done in the present case. The insects

sent from Aburi have been mostly identified, with some difficulty, but the identification has not led to the discovery of any literature dealing with their habits and economic features.

Nature of Insects sent.

The insects received from Aburi are all beetles, in different stages of development. They are divisible into two sets.

1. Longicorn Beetles.—One species of Longicorn beetle has been sent in each case as destructive to coffee, *Castilloa elastica*, and orange and lemon trees respectively. These appear to be the really injurious insects of the consignment.

2. Beetles belonging to the tribe *Heteromera*. With the exception of one species, taken by Dr. Easmon from orange and lemon trees, there is no evidence, direct or indirect, to connect any of these insects with the damage sustained.

It will therefore be convenient to consider the Longicorn beetles separately. Three species have been sent. They are:—

1. *Bixadus sierricola*, White, Proc. Zool. Soc. 1858, p. 310 (The Coffee Borer). Described originally from Sierra Leone. This insect has been sent as destructive to coffee, both Arabian and Liberian. Though Dr. Easmon seems doubtful on this point, there is no difference in the examples sent from either tree. The species attacks both kinds of coffee indifferently.

Bixadus is a sub-genus of *Monohammus*, a large genus of Longicornia, which contains two European species, *M. sartor* and *M. sutor*, both destructive to Coniferæ.

2. *Inesida leprosa*, Fabr. Syst. Ent. p. 178 (The Castilloa Borer). Described from Guinea and Senegal. This insect, familiar in collections of West African beetles, is the borer of *Castilloa elastica*.

3. *Eunidia* sp. (The Orange Borer.) This species is a small Longicorn sent as destructive to orange and lemon trees. But one example of the perfect insect has been received, which I cannot identify with any species in the British Museum collection. African species of the genus have been described from the Cape (1), Natal (8), "Caffraria" (5), Senegal (1), Angola (1), and Damaraland (1). The locality of the species sent is not far removed from Senegal; but it is impossible to identify it with the species occurring in that region, except after the examination of the type which cannot be seen.

The species of *Eunidia* are obscure and not readily determinable from descriptions.

General Habits of Longicorn Beetles.

The perfect insects of Longicorn beetles are usually rather sluggish, and are to be found by day on leaves, or on the trunks of trees, or logs. Sometimes they sit by day in the mouth of the burrows made by the larvæ. A few, chiefly of the smaller species, fly by day, but the majority fly at dusk or early in the night.

The female deposits her eggs, as a rule, in the cracks of bark, having an extensible tubular apex to the abdomen for that purpose. She does not pierce sound bark, but selects cracks, either natural fissures or cracks due to fungoid disease, wounds, &c. It is quite exceptional for a Longicorn beetle to lay on unbarked surfaces, and probably none of these species in question do so.

Several exotic species in both hemispheres prepare the wood for reception of the eggs by gnawing off a circular ring of bark round a branch. The part of the branch beyond the ring dies, and in it the eggs are deposited. This form of egg-laying is not shown, from the pieces of wood sent, to occur in the present cases, but it is important to know of its existence, as it is apt to be very puzzling whenever it is observed for the first time.

It is, I think, undeniable that Longicorn beetles will select perfectly healthy trees for oviposition, at least at certain times and in the case of certain species; but they are generally attracted to a tree by at least a local injury which affords a favourable spot for oviposition, and, in common with other wood-boring beetles, they generally prefer trees of which the health has deteriorated and especially those of which the normal flow of sap has diminished.

Causes leading to Selection of Trees for Egg-laying.

In any case of Longicorn injury, attention should be paid to the following points as likely to give some clue to the reasons which have led to the trees being selected for attack :

1. Antecedent injury by other insects especially extensive defoliation, loss of nutrition due to scale, blight, or other sucking insects; root-injury, by subterranean larvæ of different kinds such as chafer-grubs.
2. Fungoid disease, especially when attended with loss of foliage.
3. Drought, climatic or due to the presence of an unsuitable situation for planting.
4. Unsuitable soil, or soil deteriorated by over-exposure to sun, etc.
5. Imperfect root-gowth, such as occurs when the soil-depth is too shallow and the roots meet with clay or the like.
6. Gross injuries from storms, wounds involving loss of bark, and the like.

These are some of the causes which lead to selection of particular trees. But inasmuch as these insects will habitually select sickly or overshadowed trees in preference to healthy ones, when they are not so numerous as to be restricted in their choice, it must be recollected that extensive damage to previously healthy trees is generally indicative of the species having been allowed to multiply and become over-abundant in the situations which it normally selects for breeding. This multiplication is usually due to the non-removal of infested, sickly, and dominated trees, stumps, logs, and brushwood of kinds in which they will breed.

Freedom from their attacks can only be secured in situations where the trees are liable to them by strict attention to clean cultivation and the removal of all dead and dying material.

Characters of Longicorn larvæ.

The larvæ of Longicorn beetles are alike in general appearance and difficult to distinguish. They are soft and flattened, especially in front, white or pale, with a much-wrinkled thin skin. The head is short, transverse, black or dark brown, with powerful jaws, and is deeply sunk in the first segment of the body. This segment is broader than any of the succeeding, and is usually covered above with a somewhat rigid shield which protects it in burrowing. The body is flattened cylindrical after the enlarged one or two anterior segments, and is not tapering or fusiform. It is not curved ventrally, but is straight when the larva is

naturally extended. Legs are entirely absent, or present on the three anterior segments as six minute rudiments. Their place is supplied by tubercular enlargements of the sides of the segments, which, though soft, serve to give them a grip of the burrow.

Habits of Longicorn Larvæ.

The egg being laid as deeply in the crack of the bark as the parent beetle can manage, when the young larva hatches, it bores as a rule during the early part of its life in the inner layer of the bark and the outer sapwood. In these parts it excavates irregular galleries, which often intersect, and may lie in no particular direction with reference to the long axis of the trunk. *The galleries of Longicorn grubs are always transverse or flattened oval in cross-section*, corresponding with the transverse section of the larva at its largest part; this will distinguish them at once from the burrows of many boring insects. They are usually packed when fresh with fine wood-meal, the result of the boring.

The extent to which the galleries are bored superficially in the sap-wood and bark varies greatly according to the species of Longicorn. In some the larva quits the surface-wood early to burrow in the heart-wood, either up or down; in others all the boring is superficial, and the larva only enters the harder wood to make a chamber in which to pupate.

The greater the amount of this superficial boring, *the greater the injury to the life of the tree;* the greater the amount of boring in hard wood, *the greater the damage done to the timber as an article of commerce.*

With species that do a large amount of superficial boring, and especially when several larvæ are present in a trunk, large areas of bark may be detached from the sap-wood, the nutrition of the tree is destroyed at these points, and the tree may be completely ringed underneath the bark.

When the larva is full-grown it changes to a pupa in a recess at the end of its burrow, which is packed in front and behind with a plug of wood fibre. The burrow is usually continued to the outside, with the exception of a thin layer before being plugged, so that the perfect beetle can emerge easily. The beetles themselves are not wood-borers.

It must be added that in most cases, and certainly in temperate countries, Longicorn larvæ, especially those which do much boring in the solid wood, are of slow growth, and may live for a year or more in that stage. Under exceptional circumstances larval life may be prolonged for many years.

It is hoped that the foregoing general account may be of assistance in supplementing the knowledge which has been gained of the particular species in question. Of these the coffee borer will be more particularly discussed, as the specimens of wood sent throw some light on its habits. It is to be regretted that these specimens were not forwarded with a little more information. In the case of one coffee shrub, of which the main stem and roots have been sent, cut into pieces, it has been found possible to put the pieces together and, with some difficulty, to work out the various systems of burrows traversing it. These will be briefly described, as a guide to further observations. It may be added that the only way of working out the systems of burrows in such a stem is to split the wood so as to expose all the burrows, and to paint colour along the margins of each burrow and its ramifications. If each separate

burrow is thus differently coloured, the general course of them ultimately becomes evident; but unless this is done, it is impossible to delimit each burrow without confusion, and yet such delimitation is very important for studying the facts of the case.

The Coffee Borer.

The stem sent measures about 2 ft. 6 in. from the collar upwards. The main roots are attached. It contains four burrows, made by not less than four larvæ.

About 2 feet from the collar is a large eroded patch about 8 inches long, extending nearly round the stem at its lower part. From this patch the bark is removed, and the sapwood is exposed and scored with shallow grooves due to the larval burrows.

Burrow 1.—At its upper part is a hole leading into the heart-wood, this communicates with a burrow running *down* the stem for 15 inches, and communicating with the outside part of the way down by a hole with callused margins, at the bottom it turns upwards and finishes in a pupal chamber communicating with the outside by a circular flight-hole through the bark. This burrow is *old*, as seen from its discoloured walls, emptiness, and the appearance of the flight-hole. It has been made and quitted some time before the stem was cut. At the point where it enters the heart-wood from the surface there is some callus, and it appears to me that the surface mischief caused by this particular larva had partly healed, and that most of the erosion in the patch from which the burrow starts was caused by the larva which had formed burrow 2.

Burrow 2 begins at the lower part of the eroded patch and runs *upwards* for 5 inches in the heart-wood to finish in a pupal chamber *without exit*. This burrow is a season, at least, later in date than burrow 1, and its course is largely determined by the presence of the latter. Its walls are not discoloured. As there is no exit hole to the burrow the terminal chamber must have contained the larva or pupa at the time the stem was split open.

Burrow 3 begins at a second large eroded barkless patch just above the roots, common to it and the next burrow; it is about 1 foot in length, runs deeply down into the rootstock and re-ascends to open at its upper extremity by a flight-hole. This is an old burrow, about the same age as burrow 1.

Burrow 4 begins at the large patch common to it and 3, and also runs down towards the roots; it is short, not above 4 inches in length, and turns back to open at a circular flight-hole some 4 inches above the ground. The hole is fresh. The remains of the pupal packing are in the burrow, which is later in date than 1 or 3, and probably coeval with 2.

Root gnawing.

Besides these four burrows, one of the roots has been extensively gnawed in patches. I am unable to trace any communication between these patches, which appear to be isolated in places from each other, and from any of the four larval burrows. It is a matter for question whether they are due to a Longicorn larva at all, or whether they have been caused by some underground grub, such as that of a weevil (*Rhynchophora*) or a chafer (*Scarabæidæ*) or by *Metallonotus denticollis* (p. 186). If such antecedent damage were to exist, it might be of the greatest importance in causing the state of health favourable to borer attack, and at the same time be easily overlooked.

Conclusions.

1. The shrub sent has been attacked by four distinct examples of Longicorn borer.

2. While the four belong probably to the same species—*Bixadus sierricola*—it cannot be proved that more than one species has not been at work.

3. The attack begins under the bark which is destroyed over large patches. *It is likely that while the attack is going on, these patches may be capable of detection by their altered appearance, exhibition of cracks or holes, which emit small quantities of wood-powder.*

4. The eggs may be laid near the ground, or at some height, 2 feet at least, up the stem. Possibly higher if the trunk is large enough.

5. Owing to the bark destruction, the points selected for egg-laying cannot be examined in the specimen.

6. The larval life is of some considerable duration, several months at least, probably over a year. The margins of the eroded patches are callused over, showing them (in the latter burrows) to be much older than the flight-holes.

7. The larvæ eventually enter the hard wood and may burrow up or down—if down, they ultimately turn back and bore upwards.

8. Of the four burrows, two are at least a season older than the other pair. The shrub is therefore not killed outright by the first attack, though it may be so injured as to be past recovery.

9. It is not essential that the larva shall bore into the roots. Its course is determined by the situation at which the eggs are laid, and by the presence of previous burrows.

10. One of the roots has been gnawed by an insect which I cannot satisfy myself to be a Longicorn grub.

One of the shrubs sent, which I took at first not to be coffee, as it was very different in appearance from the one described on page 182, has been apparently bored by a Longicorn which is *smaller* than *Bixadus*. In this case the borings are at the upper part of the stem, just below the axils; there is much superficial injury and loss of bark and not much boring in the hard wood.

I do not think this species can well be *Bixadus* because the burrows look too small. If not, if it is some other species, it becomes all the more important to differentiate its work, habits, and share of the damage from those of *Bixadus*.

Suggestions for further observation and treatment.

1. It should be placed beyond doubt whether the borer is capable of attacking trees hitherto uninjured (to any material extent) by other species of insects. Probably leaf-eating species, and scale, blight or the like would certainly have been detected, and may therefore not be expected to occur.

Root-feeding grubs should be looked for; either weevil-grubs or chafer-grubs.

Weevil-grubs are white and soft, like Longicorn larvæ, with a large horny head, a wrinkled skin and a horny plate behind the head. The head is not *sunk* in the next segment, the body is curved from end to end towards the underside, and is thickest in the middle. There are no legs.

Chafer-grubs are white or dirty-yellow, also pale and soft; cylindrical, doubled on themselves, very large and baggy behind; with a well-developed head and antennæ, and six well-developed legs.

If any other species of insects are found to be associated with or precede the Longicorns in the damage, they must be carefully investigated as to their habits, &c.

2. *The condition of the plantations attacked should form the subject of most careful examination* with a view to detecting anything amiss in the health of the trees or the conditions under which they are grown.

If some plantations in a district are immune, whilst others suffer, an examination of each set in order to find out any diversity of conditions which is associated with the variation in liability to attack should be thoroughly made.

On this point I cannot speak from botanical knowledge, but with that limitation I would venture to suggest the following points as being worthy of inquiry:

(*a.*) The character of the soil;
(*b.*) The depth of the soil, and nature of the subsoil;
(*c.*) The water supply and drainage;
(*d.*) The aspect;
(*e.*) The condition of the plantation with relation to shade-trees.

I do not know if the Aburi coffee is grown under shade, but if not, the expedient of planting shade-trees should certainly be tried, with a view to lessen the attacks. In the severe infestation of coffee in Coorg by a similar boring Longicorn (*Xylotrechus quadripes*) there was a general opinion expressed by planters that the growing of the plants without shade-trees was detrimental to their health, caused the ground to become parched and favoured the beetle attack. Moreover a plantation with shade-trees is a "mixed growth"; and it is a general law that trees in mixed wood are less liable to insect infestation than in pure wood.

If on the other hand, the attacked coffee is already grown under shade, an examination of the shade-tree employed should be made to find out if it suffers from the same Longicorn borer as that attacking the coffee—if so it should be rejected in future in favour of some species of tree not so affected, and in plantations where it already exists it should be cared for and not allowed to become infested and breed out beetles freely, to migrate to the coffee.

If positive evidence is obtained that the infestation is favoured by any of the conditions of cultivation mentioned in this section, steps should be taken to modify those conditions in accordance with the experience arrived at.

3. Other indigenous trees should be examined to see if they are attacked by the same species of beetle. If this is found to be the case, such trees should be excluded from the neighbourhood of the coffee plantations. If this is done they should be removed, stumps and all, or the stumps earthed up. No stumps, logs, dead trees, or cut branches of coffee or any tree which serves as a host should be left about the coffee plantations. *All attacked plants which experience shows to be past recovery should be at once cut down, removed, and burned.* Probably careful attention to this matter will greatly lessen the damage.

4. The following points in the life-history of the borer should be accurately made out :—

The *season* at which the perfect beetles appear. This will probably stand in some relation to the dry and wet seasons.

The *habits* of the perfect beetles, their flight time, place of rest during the day; their tendency, if any, to frequent flowers, oozing sap, diseased trees, &c.

The *place* at which they *oviposit*. This is of importance. Probably oviposition is favoured by wounds in the bark. Special attention should be paid to the probability of the eggs being laid at pruning wounds, and the system of pruning adopted should be looked to with this object.

The *length of larval life* and the length of time a tree will withstand injury without succumbing should also be investigated.

The *early signs of injury* should be carefully made out, in order that infestation may be detected as soon as possible (*see* p. 183).

General Suggestions.

The following general suggestions for treatment over and above those already given are based mainly on the assumption that information will be gained on the above points in par. 4 :—

Prevention of Egg-laying.

All pruning and accidental wounds should be tarred.

Possibly egg-laying may be prevented at the usual situations by plastering the part of the bark usually selected for the purpose with clay and cow dung, or a similar mixture, or painting it with lime-white mixed with rice water, to make it adhere. This treatment has proved successful with other species of borers.

Capture of the perfect Beetles.

This to be successful must be attempted after study of their habits and time of appearance. It may be done :—

(*a*.) By placing sheets under the bushes, and shaking off the beetles, in the early morning or whenever they are so sluggish as to drop. The beetles should then be collected and killed with boiling water.

A convenient plan of collecting them from sheets is to fit a tin bucket with a wide funnel-shaped lid of tin, furnished at the centre with a short tube. The sheets are shaken on to the lid, the beetles drop through the tin tube, and cannot escape until the lid is removed.

(*b*.) By setting baits for them, and collecting them from the baits. This cannot be done unless their habits show that some kind of bait will serve to attract.

(*c*.) By providing logs of any tree which they will attack, ringed trees, coffee shrubs which have been condemned and are dying or have been ringed for them to lay their eggs in. These "tree traps" should be provided before the flight period and removed before the beetles in them have bred out, or they will do more harm than good.

Preservation of attacked Shrubs.

This can only be done, if at all, by attentive examination so as to detect the early signs of injury when the larva is still feeding under the thin bark. That these early stages can be detected with practice I have little doubt; whether it can be done with sufficient rapidity to make it practicable is more questionable.

If such a patch is detected, the bark should be cut away and the larva tumbled out; it will soon die if exposed to the air and light. The cut part should then be tarred.

If the patch has been opened after the larva has finished its superficial burrowing, and gone deep into the wood, it might possibly be killed with a wire, or by wetting the burrow with kerosene, which will penetrate. But these methods are not very practicable, and I regard the surface burrowing as the most important.

With the exception of these methods the larval and pupal stages are not open to measures calculated to get rid of them.

The suggestions made in the foregoing pages cover all the points by which success in the treatment of the borer appears to me likely to be obtained. That they are all practicable under local conditions is unlikely; but they are all measures which have proved of service in other countries and with other host plants.

Particular attention is drawn to the necessity for investigating the antecedent causes which may have favoured the infestation, to the desirability of studying the relation of shade-trees to the infestation, to the great importance of destroying all woody material, shrubs, &c., which may harbour the larvæ and are past recovery, to the importance of attending to pruning wounds, and of catching the perfect insects by shaking down.

The Castilloa Borer and the Orange Borer.

There is nothing to be said on these two insects which, *mutatis mutandis*, has not been said above on the coffee borer.

Dr. Easmon says "two classes of borers affect these plants, one attacking them at the roots, the other at the branches. It would appear that the operations of the latter are dependent upon those of the former, and that, as a matter of fact, they are inoperative until a certain degree of diminished vitality of the wood is reached." This is probable, and is in agreement with what has been suggested as possible, even if not likely, in the case of the coffee shrubs.

The Longicorn beetle, *Eunidia*, is the stem-borer, and its attack is therefore to be regarded as secondary.

Of Heteromerous Coleoptera (a tribe of beetles distinguished by the possession of five joints in the anterior and middle and four in the posterior pair of feet) Dr. Easmon has forwarded four species, all from decaying orange trees.

These species are as follows, the specimens are returned labelled, a more suitable arrangement for identification than the forwarding of a description:—

1. *Metallonotus denticollis*, Gray Griff. *Anim. Kingd.* II. 1832, pl. 80; Westw. *Trans. Zool. Soc.* III. p. 220. Described from Sierra Leone.

2. *Strongylium*, sp. indet.

3. *Selinus planus*, Fabr. *Ent. Syst.* I. p. 90, described from Sierra Leone.

4 *Lagria villosa*, Fabr. *Spec. Ins.* I., p. 160. Africa, widely distributed.

Nothing is known to me of the habits of these insects, and, with the exception of *Metallonotus denticollis*, it is likely that their presence on decaying trees is of no importance. They probably bear the same relation to the injurious wood-boring beetles as saprophytic do to parasitic fungi.

As far as can be gathered from the labels on the specimen-tubes sent the "root-borer" of the orange appears to be the larva of ***Metallonotus denticollis***, accepting Dr. Easmon's identification of the larva with the adult beetle sent.

This larva is cylindrical-circular in cross section, entirely horny, dirty yellow, six-legged, the head brown, the eleventh segment of the body stouter, rough, and darker, shortly spined above on its hind margin, the last segment short, forming a transverse shield, hard and rough, with a marginal series of spiny tubercles and two hook-shaped spines projecting backwards.

I should doubt this larva being a borer in wood, as Dr. Easmon's account seems to suggest. It more likely burrows in earth like wire-worms and gnaws the roots.

There is no information at my disposal which will enable me to make any suggestions upon it. One or two species of its particular family (***Tenebrionidæ***) have root-gnawing larvæ, but very little is known about them.

The habits of the insect must be investigated, and speaking on purely *a priori* grounds, I would suggest that particular attention be paid to those of the imago itself. Root-feeding larvæ are always difficult to get rid of by direct methods. But the imagos of ***Tenebrionidæ*** are sluggish in many cases, and fly little. It might be possible to devise some method of attracting them, or some species of trap, such as is done for other non-flying beetles by means of holes, trenches, or ditches in which they will collect and from which they can be removed and killed.

Until further investigation is made, it is not possible to say more about this species. One species of *Bostrychus* (*B. iniquus*, Lesne) has been sent, in the form of a single example, from decaying orange wood. The ***Bostrychidæ*** are often injurious wood borers; but it is reasonable to suppose that this species would have attracted attention if it were of importance. Its occurrence is probably accidental.

In addition to the insects injurious to coffee forwarded from Aburi, a small collection of insects has also been received from Mr. Cyril Punch, manager of the Soto Coffee Plantations, Colony of Lagos, West Africa. The specimens are accompanied with short explanatory notes.

Unfortunately, but very little can be said about these examples, which in most cases are not identifiable. Some particulars, which include the information given by Mr. Punch, are furnished in the hope that they may lead to further study of these insects in places where they occur.

1. PODURIDÆ.

A minute wingless insect, gen. et sp. incert, belonging to the family ***Poduridæ***, which contains some of the very lowest insect forms. The species sent is about $\frac{1}{25}$ of an inch long. Mr. Punch describes it in the following note as an *Acarus;* it is, however, a true insect:

"Very troublesome all the year round to coffee. It affects whole clusters of berries, feeding on the developing ovules. The fully grown caterpillar is grey with black marks, very destructive to the leaf-buds. Colonies inhabit leaves folded together, and kept so by white filaments excreted by the caterpillars. The mites hatch both inside the berries and between the folded leaves."

The slide forwarded contains a dried example of what might be a very small caterpillar, but there is no connexion whatever between it and the

Podurid, as the note seems to imply. The *Poduridæ* undergo no transformation.

The only treatment that would be at all likely to get rid of the *Poduridæ* would be by spraying or fumigation, and it seems quite improbable that so much damage is done by this insect as to justify any such measures being taken.

2. Orthoptera.

Brachytrypus membranaceus, Drury, is a very large species of cricket. Mr. Punch says of it: "This insect is present to some extent all the year round, but especially during February and March; also in August and September, but not in such quantities, nor do they cut the young plants to the same extent. Once in every five or six years they appear in such quantities as to be a pest as damaging as the locusts, destroying entire farms of succulent or young plants. Their galleries run down 18 to 24 inches, and terminate in a cell which will be found filled with the cut leaves and small stems. They are especially destructive to anything like coffee planted at even distances. Leaving the ground covered with weeds does not save the cultivated plants which they select. A space of three acres planted with rubber plants (*Manihot Glaziovii*) over which weeds were allowed to grow, had to be replanted three times this year."

In 1891, specimens of this insect received from the African Association, Limited, were reported on to the Royal Gardens by Mr. R. McLachlan, F.R.S., as follows:—

"The 'cricket' is known by modern systematists as *Brachytrypus membranaceus*, Drury (= *Gryllus membranaceus*, Drury, *Exotic Entomology*, 1773), and it appears to occur over the whole of tropical Africa. In 1801 Adam Afzelius in a pamphlet published at Upsala in Sweden, entitled *Achetae Guinenses*, but which I have not seen, described it as *Acheta vastatrix*. Judging from the specific name its destructive properties had then already been recognised.

"It is not a 'mole-cricket,' but belongs to another section of the same family (*Gryllidæ*).

"As to remedial measures, I think much must depend upon the habits of the insect as observed by those in charge locally. Your suggestion as to irrigation sounds as if it might prove useful, by driving the insects above ground where they could be destroyed. Irrigating also by means of dilute paraffin, or the 'bisulphide' so much in vogue as a remedy against many injurious insects, might be tried.

"If the gravid female insects could be destroyed before they have laid their eggs, or if the very young insects could be got at soon after their appearance from the egg, much good of a preventive kind would be done. On these points almost everything depends upon the local observers.

"The insect no doubt does not confine its attention to any particular species of tree or plant, therefore constant attention will be necessary, or, at any rate, during a certain period in each year."

It is evident that this is particularly a case where more local observation is needed. It would be desirable to have further information on the following points: whether the adults fly; what the habits of the young are; whether they migrate on foot from place to place or injure the crop only where they are hatched. If the species is not migratory it might probably be met as Mr. McLachlan suggests, by irrigation, or possibly by digging trenches into which they can fall and from which they can be collected.

In the case of the mole-cricket the digging out of the nests with the young brood proves most satisfactory.

Should, however, the species migrate from place to place and travel on foot, it can probably be kept off any crop which is not previously infested, by surrounding the cultivated area with a ditch containing water and wide enough not to be jumped over, or, as is successfully done for the North American Western cricket, by fencing in the area with boards just so high that they cannot be jumped, and furnished on the outside with a tin "gutter," *i.e.*, a strip of tin nailed along the top so as to project obliquely outwards and downwards. Plants such as coffee can be protected by surrounding them when quite young with a tin can with the bottom knocked out, unless, like the mole-cricket, the insect burrows from below. This method is in use in Florida.

3. Lepidoptera.

Caterpillars injurious to coffee :—Two species have been received in spirit from Mr. Punch, who writes of the first: "This caterpillar (A) is very destructive to Liberian coffee, but it entirely avoids the Arabian kind growing alongside. The eggs are attached to the underside of leaves. The caterpillars take about seven days growing to their full size; if left undisturbed they will strip the tree of leaves and green epidermis. Finally they fold themselves up in a leaf; the pupæ remain as such for about 14 days, and then turn into a grey-brown moth about $\frac{3}{4}$ in. long. I think the moth works at night, as I have never seen one free, only such as I have reared in boxes."

The eggs of this insect are oblong and are laid touching side by side in a characteristic ribbon-like band.

The full-grown caterpillar is some two inches long (exclusive of the posterior horn). The head is small and notched on the summit, the body is cylindrical, rather elongate and tapering behind, the first three segments behind the head are large and inflated, there are four pairs of prolegs in the middle of the body (segs. 6–9 exclusive of the head). The last segment bears a very long, slender backwardly-directed horn, $\frac{1}{2}$ in. or more in length, and the posterior prolegs (claspers) on it are aborted and rudimentary, so that the larva probably sits with its hinder portion raised in the air. According to Mr. Punch, the caterpillar is uniformly green when young, dull, with the swollen portion behind the head shining. When older it develops dark-coloured markings, the principal of these consist of a marbled pattern along the back, and a stripe on each side of the two hinder segments. The pupa is contained in a long thin cigar-shaped silk cocoon formed in a coffee leaf rolled up lengthwise.

It is not possible to identify this insect, as the moth has not been sent. Possibly it is one of the *Notodontidae*, or else allied to the true silkworm moth, approaching such a genus as *Tricula*.

The second caterpillar sent is a little smaller, not swollen behind the head nor tapering posteriorly, the hind claspers are well formed and the horn is smaller, sharper, and recurved upwards at the tip. It is lighter in colour, with a single row of small black specks along each side above the spiracles, its colour when alive has not been recorded by Mr. Punch, who says of it: "This caterpillar is of similar tastes, and while very destructive to individual trees is only found singly [? on scattered trees] and so is not so harmful."

No details as yet recorded of the life-history of these caterpillars give any clue towards treatment. On general grounds shaking-down,

or collecting the caterpillars, or spraying with an arsenical compound would suggest themselves, but the adoption of any plan must depend on local conditions and further study. Mr. Punch also writes: "The two beetles sent are enemies of the caterpillars and are, I think, increasing. They are furnished with beaks which they drive into the caterpillars and suck them dry, the dry skins being noticeable on the leaves. When many such skins are common it usually betokens a temporary cessation of the pest, which, however, breaks out again. There is no special time of the year for it. The pest started in the S.E. corner of the farm and spread it in a N.W. direction. Subsequent attacks have shown a similar tendency."

The "beetles" in question have proved to be examples of two species of bugs, Fam. *Scutelleridæ*, many of which are well known to possess such habits. Unfortunately no effective way of increasing their numbers can be suggested. The facts as to the direction in which the pest spreads appear important, but their meaning can only be worked out on the spot.

4. Coccidæ.—Scale insects.

Two species of scale insect found on coffee have been sent by Mr. Punch. One is a species of *Ceroplastes*, with an irregular somewhat star-shaped waxy scale (test); the other is a *Lecanium*; the former appears to be of little importance but the *Lecanium*, according to Mr. Punch, may be injurious.

If any treatment against these scale insects is required and can be profitably undertaken, it must take the form of spraying with kerosene emulsion or some such compound.

5. Species undetermined.

Mr. Punch has sent:—

1. Some minute larvæ which he says "cause ribbon-like marks on the upper surface of leaves, by running a gallery between the epidermis and the ground tissue. It apparently does no harm."

Beyond the fact that this leaf-miner appears to be dipterous, there is nothing to be said about it.

2. A series of small elongate narrow cocoon-like structures placed side by side and attached by their extremity to a piece of bark. These are shrivelled, hard, brittle, and homogeneous. The incomplete account sent with them states that "the pupæ adhere in lines as in the specimen to the vascular bundles. Layers are thus formed, closely imbricated, and on their development the stem is burst open longitudinally and the plant dies down to the place affected. At present four or five trees only have been affected, but while starting from the tree attacked last year, the radius of the circle of trees affected is wider. The fission of stems occurs in the months July and August. Usually the cell containing the insect opens at its extremity, but I note that those which have opened since leaving Africa have done so longitudinally. The insects in the slide have hatched since leaving Africa."

I am unable to determine what kind of insect has formed these cocoons, and Mr. Punch's account gives no clue. On the whole, it seems most probable that it is dipterous.

The insects referred to as having been hatched were present in the slide in some numbers. They are an extremely minute form, about $\frac{1}{50}$ of an inch in length, and at first sight resemble a thrips. The antennæ,

however, are not those of a thrips, but are elbowed and clubbed; the specimens are not preserved so as to admit of careful examination, but they appear to be a hymenopterous parasite, probably of the family *Mymaridæ.*

Both the cocoons and the supposed parasites appear to be of some interest, and it is a pity that the scantiness of the material does not allow a more thorough examination to be made.

(Signed) WALTER F. H. BLANDFORD.

DLVII.—FRUIT-GROWING AT THE CAPE.

The following interesting paper on the possibilities of the fruit industry in Cape Colony has been communicated to Kew by the Government Botanist, Professor MacOwan. It affords a striking picture of the resources of a country where "all the fruits and crops of the warmer temperate zone grow to perfection." This information is supplementary to that already published in the *Kew Bulletin* (1888, pp. 15–19), and gives in an expanded form with greater detail the facts already given in the volume for 1893 (pp. 8–11).

"At the present moment there are in every direction openings for enterprise in various kinds of *petite culture*, openings such as have never existed here within the memory of man. It is not as if one had to speculate upon the chances of perishable produce being got across the line and placed upon English markets in saleable condition. But for everything that a man can grow to a moderate degree of perfection, there is an unfailing market just some forty or fifty hours distant from the coast, and the rail to expedite it all the way. It is said to be well for a man to have two strings to his bow. The up-country market is the Cape growers' first string, the export trade in fruit is the other. All the special appliances required for both lines of the enterprise are already provided. The steamship companies supply cold-storage on their vessels. A local firm has prepared refrigerating chambers for goods awaiting shipment. It would seem, therefore, that the only element required is an increase in the number of intelligent and practised growers. We want them from England, from the States, from California, in fact from anywhere where the skill and experience required has run for years into everyday practice. This is the immigration wanted just now at the Cape, to catch at the opportunity of the moment, and to turn skilled fruit-growing into gold. No question that success awaits the man who knows how to deal with fruit-trees, to break his ground up properly, to drain, to prune, to gather, to pack for market up-country, or for market in Covent Garden, and who has the well-founded contempt for the slovenly style of letting things grow themselves, and taking as a crop what chance sends and insect plagues leave.

"Then you will say, Are there no growers at the Cape? Truly very few: here one, there one, but by no means sufficient to give a character to this magnificent country as a home of fruit-growing,—not sufficient even to lead by example the prevailing carelessness into better ways. The growth of fruit here has been almost always a by-thing, or what we might call a toy pursuit of the landowner. A few trees, mainly seedlings grown from pips and fruit-stones, planted in holes dug in the hard untrenched earth, unpruned and untended, except for an occasional drenching from

the furrow, used, generally speaking, to constitute a Cape orchard. So long as the owner had fruit for his own table during the season he was satisfied. The idea of growing fine choice fruits of named pedigree sorts in order to send them to market, attractively packed, so as to suit the dessert tables of well-to-do townsfolk who had no gardens, never entered his mind. Do you want fruit of him? Then you must buy it as a favour, and he would 'spare it to you,' and you certainly could not expect to get it twice, much less regularly through the season. Yet he would take the money, showing that the commercial instinct was not dead. The wonder is that so few ever turned to with a will, and put into fruit-culture the labour, energy, and forethought that go to make a successful business. Things are a little better now. There *are* a few men, three times as many as there used to be, who now grow fruit to the perfection possible in this perfect climate, and all they send to market is eagerly bought up either for local consumption among the higher classes or for export to England. But they may be counted on one's fingers, in place of being numbered by hundreds, and scattered all over the country. Then you will say, With what is the ordinary market supplied? Truly with fruit of the poorest quality—the product of seedlings instead of grafted trees—bastard refuse, without a name and without a single quality to recommend it. It looks as if it had grown itself, and this it mostly has. The ruling condition of the fruit, such as it is, is worsened by utter ignorance of proper packing and transit. Much of it is shaken down and tumbled into old paraffin cases and jolted to market in a springless waggon. Hence it must be picked only three-quarters ripe, so as to bear the rough usage without being turned to unsaleable pulp. One would think that the example of the few leading men aforesaid, and the high prices they pull off for their exceptional samples, would be sufficient to start a reform, but there are several causes operating in the other direction. There are the antiquated conservative ways of the small farmer at the Cape, arising out of the comparative isolation in which he lives, and which only has been broken in upon this last year or two by the establishment of fruit-growers' associations in their very midst, through which an effective interchange of ideas has been brought about, and information given upon the subject of their special industry. Till these excellent associations sprang up, mainly through individual activity and personal influence, it was difficult to find a market gardener who took in a garden periodical, or cared to learn what was done in other countries. Another cause materially checking the desire to improve the output is the immense demand that exists for cheap coarse fruit and windfall rubbish among the coloured populace of Cape Town. To them, so that the fruit is dirt cheap, it does not matter how dirty it is, nor are they disgusted at seeing the same baskets which brought the fruit to town piled up among the stable manure the cart takes back in the afternoon. In no other public of fruit consumers is quality so little thought of, and hence the producer has been satisfied to grow crops from seedling trees which are only fit for stocks. They sell somehow, so why should he trouble himself to produce a better article? However, things are on the mend. It may be a long time before really good or even middling fruit reaches the level of the street hawker, but the simple fact that the great market of Johannesburg discriminates keenly between good and bad, and pays accordingly, must inevitably react on the producer, and even more directly persuasive are the perpetual calls of the fruit agent concerned in export to Covent Garden. He knows good fruit at sight if anyone does, and his determination to have it grown clean, ripened exactly to the export point, gathered

delicately, and graded to size, will do more towards teaching fruit-culture than a legion of experts.

"It is, therefore, just at this critical stage of matters that the English fruit grower who now despairs of making profits at home is invited to come to the Cape and take his opportunity by the forelock. It is a pity, too, that the foreign capital which comes Capewards goes mostly into mining stock. It were well if some of it were invested in the healthier industry of fruit-culture. Perhaps ere long the one or two companies which have already got into working order will form an example to other companies and friendly competitors in a trade which is practically illimitable.

"We have said that all the material appliances for a growing export fruit trade have been initiated here. It is not therefore as if new-comers, throwing their practical knowledge and their little capital into Cape fruit-growing, would find difficulties in the outlet for their produce. Let it be remembered that the Cape has one signal advantage for fruit supply to European markets which is not conceded to the clever and enterprising American grower. *The seasons fall conversely with those of England.* Consequently the only competitors in our special line and special time of exporting will be the Australians, who, however, are heavily handicapped by a one-third greater distance from England.

"This general arrangement must not be taken too absolutely. The seasons on the two sides of the Colony, west and east, are differentiated much as are those of India, by the rainfall occurring conversely. In fact, the Cape is a monsoon country, the west having its maximum rainfall in winter, while the east has it in the warmer months. There is this peculiarity also in the east, that there are two maxima, namely, the November or spring rains, and the autumn rains in February.

"From these peculiarities arise important results in fruit-growing. The most striking is the the limitation of uniformly profitable wine, grape, and raisin production to the Western Province, which possesses the necessary hot and dry summers for the proper ripening of the fruit of the vine. In the east, with its dispensation of summer showers and frequent hailstorms, with much heavy rain in February, viticulture is reduced to a branch of gardening, and it is questionable if anything more than table grapes for local consumption, such as the *Crystal* and *Sweetwater*, can be successfully managed. Of course this is a general statement, subject to here and there an exception, dependent upon climatic conditions. For example, good results have been obtained in the somewhat intermediate climate of the Karoo, particularly at Graaf Reinet and its neighbourhood. The total rainfall throughout the Karoo averages low, say 16 to 19 inches annually, as compared with 28 to 30 inches in the normal eastern region. But the rule holds good in a general way, and a glance at Gamble's diagrams of rainfall, where the curve is plotted for a large number of places, so as to be readily comparable by the eye, will enable one to determine where viticulture on a large scale is climatically favoured, and where it will present special difficulties. In the former case the rain curve for January, February, and March—the ripening and vintage months—keeps at or below 1 inch; in the latter it runs up to the monthly maximum for the year, say 3·5 to 4 inches. The Sunday's River valley upwards from the Addo, and also perhaps the hot sheltered environs of Uitenhage, are the best examples of local eastern exceptions to the general rule. But even here grapes will have to be tended with very much greater care

and intelligence than seems to be necessary westaway. The great difficulty will assuredly be the general prevalence of anthracnose, or black-spot, as it is sometimes called (*Sphaceloma ampelinum*, De By). This plague, though far from being comparable in mischief to the Peronospora of the vine, which luckily we have not yet imported, is still an enemy to be reckoned with, and it will be necessary that all eastern vineyards be assiduously treated by spraying with Bordeaux mixture as a preventive of the scourge. There is little doubt that success will attend the proper application of this remedy, just as has been proved to be the case in Europe. But the additional charges for skilled labour in its use will heavily handicap the eastern producer, especially if he should incautiously cultivate the more delicate varieties of vine, say, for instance, the Cape western Haanepoot, known elsewhere as Muscat of Alexandria, a sort which is particularly liable to the attacks of Anthracnose.

"New comers to a country who have been accustomed to the class of grape which is seen upon English dessert tables, will be surprised to find that nothing has ever been done at the Cape at all comparable to the minute care which grapes receive at home under glass at the hands of skilled gardeners, who have made this fruit a special study. As we have them, the grapes are fairly good, and up to size on the outside of the bunch, but, by carelessness and want of proper thinning, they are not half-grown or half-coloured in the middle. The plan has been to grow grapes for wine and for the table in the same vineyard, and with the same low average of attention. That is to say, the table grapes have practically grown themselves, instead of each bunch having been the subject of individual inspection and treatment with the thinning scissors. Perhaps some skilled gardener, who knows what a dessert bunch of grapes should look like, may find it worth while to show what can be done in this country, where the climate renders his glass-house and hot water pipes unnecessary. Certain it is there is no lack of wealthy folk here who will buy grapes of English hot-house type at their full value. *Mutatis mutandis*, much the same thing may be said of other fruits, peaches and pears particularly. Our growers have had no high standard to work up to, and have been too easily satisfied. The comments of Covent Garden salesmen upon picked Cape samples have certainly opened their eyes somewhat, and given them to see that the fruit which has been taken as first rate, levels down to scarce a second place when put beside first-class produce skilfully grown at home. We have taken things too easily, and left too much to nature, forgetting that the finest type of fruit is decidedly a product of art, for which nature provides only the raw materials.

"In western markets, January gives the last of the strawberries and apricots which have been to hand for some five or six weeks previously. The earlier sorts of grapes, pears, and apples according to kind, also the earlier peaches, plums, and figs, fill up the list. From the conditions of the climate it is rather a cultural mistake to try and hurry things by planting what are known in Europe as early-fruit sorts. Cape conditions are much more favourable to perfection in the later kinds, at least in such parts of the country as lie upon the first plateau reaching inland all round the coast. Further up-country on the narrow second and the immense third plateau, which reaches a level of approximately 4000 to 5000 feet, the conditions are considerably altered. But the gain expected from the growth of early sorts at this level is practically interfered with by the tardier approach of spring and persistence of a dry winter's cold. The results of the most experienced cultivators

is decidedly against experimenting with early sorts in the hope of catching the high prices asked in an early market.

"In February the better sorts of apples, peaches, and nectarines come forward; and a glance at these will show conclusively that they are mainly late European varieties, and accentuate the caution we have given against early sorts, at least for market supply on the large scale. Grapes and melons are becoming plentiful, and begin to acquire their proper distinctive flavour, unless they have, as is often the case, been spoiled by injudicious irrigation. The fruits of keeping quality are now approaching the season for picking. As a rule they are left too long upon the tree for want of two things,—first, want of practical knowledge of the precise degree of growth at which to take them, so that they shall best develope the richness and flavour that come by keeping; and second, want of something like a reasonable fruit store, where they can be laid out properly, inspected daily, and kept at even temperature. It is pitiable to see good keeping sorts huddled up in boxes, a bushel or more together, in a galvanised iron shed open to the light and the weather, and varying in temperature daily from 80° to 90° at noon to 48° or 50° at night. This is another matter in which we want some gardening missionary to come over and teach us a gospel of better things.

"In this month and in March begins the first drying season,—that is to say, fruit-drying in the sun, as opposed to fruit-evaporating, the more practical, more cleanly, manageable, and time-saving plan. Already very fair work of this kind has been done, and the Wellington dried fruits have quite fetched up to the already high standard of the raisins produced in the Worcester district. The only reason why these products are unknown outside the boundaries of the colony is that the amount produced does not bulk large enough, and that they are almost entirely consumed locally in the colony. The output is not a hundredth part of what it should be, and what could readily be absorbed by the Cape consumer. Hence in this case, as in so many others, we stand in the somewhat absurd plight of possessing the finest country in the world for production, and yet being content to allow ourselves to be served by manufacturers and dealers who grow and fetch and carry for us away on the other side of the world. How long this anomaly is to continue, and a Cape rural population is to think it no shame to have on their tables American dried apples and peaches, and positively to import American fruit pulp wherewith to make "Cape jams," rests with the coming race of fruit-growers whom we hope to attract to the country and help us to put a little life and stimulus into our easy-going, lotus-eating lives. Do not for a moment suppose the thing is here put sarcastically or in an exaggerated manner. The whole output of first-class Worcester raisins was last year bought up, as a matter of course, by *two retailers* in Cape Town. The year before the same buyers collared it all. Is it not clear that our production has yet to expand itself into wholesale proportions? Another retailer, on examining an exceptionally good sample of dried figs that ran the imported 'Elemi' article very close, offered the producer an Elemi price. Picture his disgust on being advised that the total stock produced that year amounted to only *six* boxes. And so with the prunes. We are content to buy continental jars of 'Prunes d'Agen' and 'Prunes d'Ente' year after year, forgetting that no better prune-growing land than this exists on the face of the earth. Truly, in face of such facts as these, one does not know whether to laugh, to cry, or to swear. But one thing is certain, that with present conditions at the Cape, with family grocers buying up all the raisins that a whole district produces, with farmers content with a

dried fig crop which a man could carry on his shoulder, there must be a good many fair fortunes lying about loose at the Cape, and only waiting for some one with moderate commercial instincts, industry, and business capacity to come over and appropriate them to himself.

"March, of all the months of the year, shows the barest fruit market, at least in the way of fresh kinds putting in an appearance then. The supplies are chiefly late apples and pears of the keeping sorts, and these, when they come to sale, bear plentiful testimony to the rough way in which they have been handled and stored. The outside skin is scratched, discoloured, and far from appetising. Ere long the dealers will learn that fruit ripened in the storehouse must receive attention and handling somewhat different from that which is accorded to the year's crop of potatos. A few peaches of late kinds come in and generally secure good prices. For the most part these are seedlings that have originated here many years ago, and, though fairly good, belong unfortunately to the series of clingstones. There is an opening for considerable improvement by selection of the improved modern late freestones. In all these fruits the variety of sorts presented on the market is very limited, and the knowledge of named kinds is generally absent. It is impossible to go to any retail dealer and ask for a Bon Chrêtien or Ribston Pippin apple. The seller would simply gaze at you in astonishment as if you were speaking a foreign language. All this will have to be changed, and no doubt with a continued demand for fruits by name the dealers will gradually learn something more about the details of their trade than at present they seem to think at all necessary. The month closes with the last of the grapes.

"April, May, and June present few novelties. The guavas of many seedling kinds fill up a place which is hardly warranted by the intrinsic value of the fruit as at present grown. We have them from the insignificant bulk of a gooseberry to that of middle-sized apples. But very little attention has been given to culture, and still less to improvement of sorts. It may be said that the guava, as grown here, is often practically a wildling, and it would be well if nineteen out of twenty of them were destroyed, and selected grafted plants put in to take their place. Some day we shall get rid of the mass of bony seeds which fills up the centre of the market guava, and shall aim at making it a more presentable fruit. Walnuts and chestnuts now make their appearance. The former have not received fair play. They, too, have been propagated in our careless Cape way by seedlings, and it is only within the last twenty months or so that the fine imported sorts, in which the French growers have had such success, have been brought into the country. The remainder of the supply of these months is from Natal, whence our market is flooded with small pineapples and bananas. The former are remarkable for being nearly all outside. Of late, a slight improvement has been observable in the quality of these fruits; and when the matter comes to be inquired into, it is found that nearly all the finest fruit, classed roughly in the popular idea as Natalian, turns out to be the product of a few recently established plantations along our own eastern coast. There can be little doubt that this industry will increase year by year to very considerable dimensions. The growers have begun the proper way, namely, by discarding the small, hard-skinned, and half-grown wildling pine, that has so long been foisted upon us, and going to Ceylon and the West Indies for the very best sorts procurable. From this source, too, will be obtained large supplies of the Cape gooseberry (*Physalis*), which is perhaps the most delicious fruit for canning and preserves that the whole world has to show. We have been accustomed to despise it, simply because it

grows wild without care or culture. The jam factories are, however, already increasing their output of it, and making it worth while for people to undertake its production as a *petite culture*.

"With the last days of June and the first of July come in the whole tribe of citrus fruits, orange, lemon, naartje or tangerine, and pamplemousse. From the variations of climate and altitude which have been signalised at the beginning of this article, it follows that these fruits hold their place on the market continuously till December, their peculiar external character and power of ripening up after gathering rendering them comparatively easy of transport from long distances. The locally grown fruit is perhaps at its best in October,—that is to say, it can then be picked and marketed perfectly ripe, instead of gathering it green and trusting it to slow ripening in the store-room. Perhaps in the case of no fruit more than these has the public mind been so thoroughly awakened to the necessity of improvement, and discarding the wretched seedling rubbish, full of pips and cased in the thickest of skins, which has for many years encumbered our markets. The importations of good grafted trees of the best sorts have been very numerous; and if the cultural conscience can only be aroused to the necessity of a vigorous crusade against the scale-insects, which up till now have had it all their own way, and also the necessity of giving orchard trees something like fair play and reasonable care, there will be amongst us quite a new era of citrus fruit-growing. The great desideratum is that the spirited proprietor shall himself grow the oranges, instead of leaving them to grow themselves. At present our largest supply, in Cape Town at least, comes from Natal, and it is not particularly good. The best Cape grown oranges are from the district of Clanwilliam.

"October brings with it the Japanese loquat, another fruit which calls for selective improvement. There is as yet far too much pip and too little flesh upon the ordinary loquat. Yet there have arisen in several private gardens seminal varieties showing a commencement of better things. These should certainly be increased by grafting, as far as possible, instead of reverting to the chance seedling mode of getting new trees.

"With November come in the earlier figs and the strawberry. There is a future for the fig, and its selected Cape home and centre of drying for commercial purposes will probably be somewhere in the Karoo. It is true that we have not, native, any insects similar to the *Blastophaga*, which assists in the perfecting of the celebrated Smyrna fig. But in these days of quick steam communication it is not impossible to introduce this useful insect, just as we have successfully acclimatised the *Vedalia*. As to strawberries, the selection of sorts, grown chiefly at Stellenbosch, is very limited, and modes of culture anything but modern. As a rule, the beds are allowed to continue production for far too many seasons, and the fruit consequently deteriorates, losing both size and succulence. New blood and new ideas, with the habit of modern practice in strawberry-growing, as it is done in Kent and Surrey for the great London markets, is very much wanted at the Cape. The demand for the fruit is practically unlimited. The month closes with the early apricots, and this delicious fruit queens it right through December. If our growers would only learn the first principles of pruning this far too generously growing fruit tree, keep its bountiful nature well under control, and thin its bearing to something like one-half, then truly would the Cape have such apricots as no other place in the world could show.

"Whoever reads this little *resumé*, and begins to turn over in his mind the idea of coming out to the Cape to utilise there his practical knowledge

of European fruit-growing, will naturally ask what conveniences already exist in the way of supply of orchard stock. Every practical man would hesitate to bring out with him a lot of grafted trees, selected as best he could, for a country he had not even seen, and of whose climate and soil he had had no experience. But very recently there have been introduced into the Colony large numbers of the very best modern fruit-sorts of all kinds, by men who have themselves practically learned the capacity and conditions of the Cape as a fruit-growing country, and it is not too much to say that, by their industrious multiplication of these picked kinds, the market for first-class orchard stuff is now amply supplied. There is no reason now for continuing the old system of seedlings, unless out of pure wrong-headedness and refusal to take up with improved methods. So friendly is the climate here to the skilled manipulations of the nurseryman, that first-class grafted yearlings can be obtained at prices not greater than those ruling in England, and thoroughly reliable to name and graft-stock. To import for oneself on coming out to the Cape would certainly involve the loss of a season, to say nothing of difficulties in the way of immediately finding ground wherein to set out the consignment. Immigrants of the kind one would so gladly see spreading themselves over the best districts of the Colony, each with his market-orchard grown and tended in the way that means business and sound profits, would be wise not to start at once, but to spy out the country first for themselves, and for themselves see what our grapes of Eshcol are like, take stock of us and our little old-fashioned ways and conservative habits of working, and then only, when the land was no longer strange, and the altered climatic conditions have become familiar, to exploit their capital on some selected fertile piece of land, and add to the wealth of their adopted country by successfully adding to their own.

"A brief memorandum like the present cannot by any means give all the information that an English fruit-grower would find useful when he is thinking of looking out for fresh fields and pastures new. It would be well to note carefully the details to be found in the *Illustrated Handbook of the Cape*. But perhaps the best idea of the way cultural matters go on here, and the peculiar conditions of Cape rural life, would be obtained by consulting the issues of the *Cape Agricultural Journal*, now in its ninth volume. At the basis of all calculations lies the fact that the Government, unlike those of Australia and New Zealand, have no available acreage out of which they can make free grants to new-comers, and this is simply because the Colony dates back some two centuries before the time when the sister Colonies began to be exploited by the intrusive European. All available land, at least within colonial boundaries, has long ago been taken up, and is in private possession. Purchase or tenancy at a moderate rent is therefore a prime factor in all forecasts of new cultural ventures. Suitable land, even such as has never felt the plough, but is simply sat upon by the proprietor, and goes with his pasture area, would sell at about 10*l*. per morgen of two acres, provided it were within easy reach of a market by railway. The rent would perhaps be 10*s*. to 12*s*. per morgen. Mere wheatlands would fetch very much less, and if distant from the railway might perhaps be valued at 12*s*. to 20*s*. per morgen. Mashonaland certainly offers unlimited scope, but its market is yet to be made. Also it is only near the larger centres of population in the south-west that labourers can be found who have even a small degree of skill in the ruder operations of cultural work. Coloured men, the descendants of the old slave population, with a considerable amount of miscegenation, can be relied upon to

trench, dig, and hoe orchard and vineyard, to plough and harrow, and to give the vines their annual prunings, and some of them have even recently learnt to graft with fair success. Of course all this is subject to a vigilant supervision, and subject also to the fact that the labourer's wants are so very few as to make him somewhat independent. He therefore favours his employer by working, when he is in the mind, at half-a-crown per day. The better men readily get another shilling, and are a good deal sought after. Mere farm labourers receive 25*s.* per month, with rations for self and family. As a rule these last are perfectly unreliable, and are unacquainted with the use of other than the simplest hand tools.

"In conclusion, it is highly advisable for any one intending to try fruit-culture at the Cape to bank his capital on arrival, and arrange to receive the colonial rate of interest, meanwhile seeking out a situation with some one who is already owner of the land upon which he lives. This would be the best course, even if no salary and nothing but board were offered in the way of remuneration for services rendered. In a short time experience in Cape ways and Cape seasons would thus be gained, and the land spied out. It is much after this fashion that the best and wealthiest farmers among us have worked their way in and up. The European coming from an English farm and making a beginning without local knowledge, has much to learn and unlearn, or he will inevitably come to grief in a few years. And what is true of the larger venture of farming is even more certain with the somewhat more refined economy of the orchard.

"The following details as to the export of fruit from the port of Cape Town during the season of 1894 is drawn from the Customs returns. It is impossible to say accurately what proportion this bears to the quantity sent up to the ever ready market of the Transvaal, but in the opinion of those qualified to judge it has already been tripled or quadrupled.

RETURN OF FRUITS EXPORTED DURING THE SEASON 1893–94.

Sorts of Fruits.	December.	January.	February.	March.	April.	Total.
Apples	—	—	89	41	50	180
Apricots	12	12	—	—	—	24
Gooseberries	—	—	1	—	—	1
Grapes	—	443	3,139	1,800	901	6,283
Grenadillas	—	1	—	—	—	1
Melons	—	4	113	—	—	117
Nectarines	—	4	19	—	—	23
Pears	—	—	175	164	43	382
Peaches	—	530	46	—	—	576
Pineapples	—	—	—	7	—	7
Plums	—	—	1	—	—	1
Quinces	—	—	—	30	1	32
Tomatoes	—	13	43	1	—	57
Total packages	12	1,007	3,626	2,043	995	7,683
Declared value - £	4	182 7 6	784 9 0	476 6 3	274	1,721 2 9"

DLVIII.—CANAIGRE.

(*Rumex hymenosepalus*, Torr.)

The history of this new tanning material was given in two previous articles in the *Kew Bulletin* (1890, pp. 63–69, and 1894, pp. 167–168). A figure was given in 1895 in the *Botanical Magazine* (t. 7433). According to the following extract from the *Report for* 1896 *on the Trade and Agriculture of California* (Foreign Office 1897, Annual No. 1922), it is rapidly making its way as a tanning material for light leather.

"Canaigre is the American corruption of the Spanish "cana agria," sour cane. It is also called "Yerba-Colorado" in Mexico, localisms being "red dock" "tanner's dock," and "wild rhubarb." The best way to propagate the plant is by use of small roots rather than by seed. About 1,000 lbs. of tubers will plant an acre, and October and November are the best months for putting in the crop, though where irrigation can be practised, planting may be done at any time. The value of canaigre as a tanning agent, either alone or in connexion with other tannins, has been proved beyond question. For light leather it gives great tensile strength, and is far better for split leather than gambier, oak, or hemlock. It is a quick tanner, and the yellow colour absorbed by the hide in the process of tanning is considered highly desirable for certain leathers. The sliced and dried tubers, containing an average of 30 per cent. of tannic acid, are worth from 8*l.* to 9*l.* per ton. A yield of from seven to 10 tons per acre would give 2½ to 3½ tons of the dried product, for which there is a constant demand in Europe and America. Inasmuch as the plant grows wild in this vicinity, and the seed roots are readily obtained, the industry commends itself to the farmer of small means, as it is harvested in such a short period after planting."

DLIX.—EXTRACTION OF GUTTA PERCHA FROM LEAVES.

The following communication supplements the information already given in the *Kew Bulletin* (1891, pp. 231–239).

Extract from letter from Director of Gardens and Forest Department, Straits Settlements, to Royal Gardens, Kew, dated Botanic Gardens, Singapore, September 18, 1896:—

"I have just been down to inspect the little factory where Mr. Arnaud makes his gutta-percha. Serullas has gone back to Paris with endless patents of different kinds, and Mr. Arnaud alone keeps up the business. The leaves are imported in sacks dry from Borneo and Johore. Most of the trees are overcut in Singapore, and there are no more leaves left, I hear. The leaves and twigs cost four dollars and a half a picul (133 lbs.) They are then put, damped with hot water, into a rolling machine, two rollers working against each other, which grind them to powder. The powder is thrown into tanks of water and shaken about. The gutta floats in the form of a green mealy-looking stuff, is lifted out by fine copper gauze nets, put in warm water and pressed into moulds. I have samples of the gutta as it comes out from the leaves, and the pressed out finished article. It is really a very curious little manufactory. I do not know how long it will last, on account of the difficulty of procuring leaves, which must, I think, sooner or later stop the trade."

DLX.—WINE PRODUCTION IN FRANCE.

In the *Report on the trade of Bordeaux for the year* 1896 (Foreign Office, Annual Series, 1897, No. 1916), which has been communicated to Kew by the Secretary of State for Foreign Affairs, a striking picture is drawn of the effects of the phylloxera on the wine production of France, and of the various expedients which have been resorted to to make up the deficiency in production.

Annual Production.

"The annual wine production of France, which during the 25 years preceding the year 1879 amounted on the average to 1,100,000,000 gallons, a quantity sufficing both for the wants of home consumption in this country and for those of the export trade to foreign countries (about 65,000,000 to 75,000,000 gallons per annum), has since that time (in consequence of the ravages of the phylloxera and other vine diseases, as well as of unfavourable atmospheric influences during many years) declined to an average annual yield of about 725,000,000 gallons, a falling-off, therefore, of about 375,000,000 gallons per annum.

"In order to meet this deficiency France, as is well known, has been obliged to import largely foreign (more especially Spanish, Italian, Portuguese, and Dalmatian) wines, which are to some extent sold in their original state, but the far larger proportion are used for blending with the light French wines of the commonest class. These blended Franco-foreign wines find a ready market, as they are by no means always unpalatable, and often very fair (nor are they unwholesome, as they are, after all, mixtures of the pure juice of foreign and French grapes); they are served as so-called 'vin ordinaire' in a large number of even the better-class of hotels and restaurants all over France. On the other hand, however, the dearth of the cheapest kind of French wines, which in former times were abundant enough to be obtained even by the most modest purse, has given rise to a great development of the manufacture of artificial wines (made from raisins and other grape substitutes), and these find a ready market, especially amongst those poorest classes of the population who look more to the low price than to the quality of the liquor, of which they are accustomed to drink a large quantum. That in the Gironde, for instance, this daily quantum of wine is considerable amongst both the poorer and wealthier inhabitants is evident from the fact that the average annual consumption of wine per head of the population in this department amounts to 32·34 gallons.

Artificial Wines.

"Though the importation of foreign wines and the manufacture of artificial wines had the natural effect of keeping the prices of the genuine French product on the whole at a low figure, their competition was not so seriously felt and complained of by the wine growers and merchants of this country so long as the supply of such foreign or artificial wines kept within the limits annually required for meeting the deficiency in French production.

"But of recent years the manufacture and sale of artificial wines in France, as well as the importation of foreign wines, have experienced such an extraordinary development that the genuine French article is now being driven out of the market, and wine growers and merchants every year find it more and more difficult if not impossible to dispose

of their accumulating stocks of red and white wines of good quality. Considering, moreover, that the majority of French vineyard owners have, during the last 15 years, spared no trouble and (when they could afford it) no expense in combating the many vine diseases, and, if necessary, in replanting the devastated vineyards, and that the sacrifices thus made are, to all appearance, certain to bear good fruit in the future, and will, at a not too distant date, bring to France a return of her former abundant wine production, it is evident that the gradual flooding of the markets of France and also foreign countries with foreign or artificial imitations of French wines must create considerable dissatisfaction amongst both vineyard owners and wine merchants in Bordeaux and other prominent wine-producing districts of this country. The French Government have, during the past year, in consequence, been strongly urged by the wine merchants and vineyard owners of the Gironde and other departments to apply the existing laws against fraudulent imitation of wine in a more vigorous manner, and in the interest of the honest trade to increase their stringency; and it has further been requested to take steps for raising the import duties on Spanish wines (and any other foreign wines not taxed so highly). A project of a new law dealing with this subject was submitted to the French Chamber last autumn and passed after certain modifications had been introduced.

Phylloxera.

"An idea of the extent of the widespread damage caused by the phylloxera since its first appearance 17 years ago, in the more or less valuable vineyards of the Gironde Department, may be gathered from the fact that of the aggregate area of land planted with vines in the Gironde in the year 1879, which is officially estimated at 450,000 acres, only 81,820 acres have (owing apparently to the silicious nature of the soil) entirely escaped the incursion of this noxious parasite. The total area of the vineyards which have been more or less seriously infested has, up to this date, reached 368,200 acres. Of this large infested area 104,310 acres have been uprooted and replanted with American and Franco-American vines which are able to resist the attacks of the phylloxera; 49,807 acres of vines are subjected to a continuous preventive treatment which prevents the phylloxera from extending its destructive work, and 100,950 acres are, owing to the inability or unwillingness of the owners to defray the heavy cost of combating it, left to its mercy, and suffer of course seriously in their productiveness. But the remaining 114,100 acres of vine-growing land infested by the phylloxera since 1879 are no longer cultivated with vines, and are now either lying waste or have been converted into grass land.

"Thus the aggregate area of vineyards under cultivation in the Gironde at the beginning of the year 1896 was only 336,900 acres; figures showing a very large diminution compared with those given above for 1879. They moreover also show a small falling-off, namely of 8,375 acres compared with the figures for 1895, which was due to the fact that whilst 12,410 acres of diseased and unproductive vines were uprooted in 1895–96, the area of fresh vine plantations reached only 4,035 acres.

"Amongst the 336,900 acres of vineyards existing in this Department at the commencement of last year 104,310 acres consisted (as above stated) in fresh plantations gradually made since the date of the first appearance of the phylloxera; of these fresh plantations 5,212 acres were in American direct-producing vines, but by far the larger proportion, viz., about 98,000 acres, consisted in American vines grafted with

French plants. The extent of fresh plantations with these Franco-American vines has, of late years, been and is still steadily increasing, whilst those of direct-producing American vines are being gradually less resorted to. It is, however, pointed out by competent viticulturists that in spite of the success obtained by the former, great care should nevertheless be taken to select the right species of American vines for grafting upon, for if this be not done, the eventual success of the operation (though the first results may appear satisfactory) must be uncertain.

"The considerable expense of the preventive treatment of the vines (in order to combat the inroads of the phylloxera) by the various chemical remedies as well as by submersion of the vineyards under water, which latter method is indeed only practicable in some localities, and the generally favourable results attained by the fresh plantation, have gradually led vine proprietors to the conclusion that the least expensive way of combating the phylloxera is indeed to uproot the infested vineyards and to recultivate them with American vines grafted with French.

"There can now be no doubt that owing to the considerable increase in the value of a vineyard, consisting of vines which are thus not only able to resist the inroads of the phylloxera, but which are extremely productive, proprietors would in ordinary conditions soon find themselves repaid for their first outlay and trouble. Unfortunately, there is the existing difficulty, the competition of foreign and artificial wines, a circumstance which will render unprofitable, not to say disheartening, these and other efforts on the part of the sorely tried growers towards improving their property and increasing their wine production.

"It may be here observed that the total actual pecuniary loss caused up to the present time to the vineyard owners of the Gironde Department by the ravages of the phylloxera, arising both from a diminution in the area and the productiveness of vine growing land, is estimated at about 26,000,000*l.*, and that of the total cost incurred in reconstituting the devastated vineyards as well as in combating the spreading of the phylloxera at about 6,000,000*l.*, thus showing an aggregate loss of about 32,000,000*l.* to the viticulturists in this department alone. If the loss and expense occasioned by the phylloxera in all other wine-producing departments of France were added, it is probable that a total estimate considerably exceeding 100,000,000*l.* would be reached."

Other Vine Diseases.

"The well-timed and preventive treatment of the vines with the 'Bouillie bordelaise' (see *Kew Bulletin*, 1888, 271), which with very few exceptions has now become a standing practice amongst growers, had the desired effect of keeping the vineyards free from mildew, a disease feared at one time almost as much as the phylloxera itself. On the other hand the kindred pest called blackrot showed itself in many parts of the Gironde, though the damage done by it was, in consequence of preventive treatment taken by growers, not so serious in 1896 as had been feared. Though the use of the 'Bouillie bordelaise' as a preventive against blackrot is of considerable value, no thoroughly efficacious remedy against this disease appears, in spite of continued elaborate experiments, to have yet been discovered."

DLXI.—UNITED STATES NATIONAL HERBARIUM.

The development and organisation of the most important botanical institutions of other nations is of especial interest to Kew, which is necessarily brought into close relations with them.

The following account of the United States National Herbarium at Washington, by Mr. F. V. Coville, Chief Botanist to the United States Government, is therefore reprinted from the *Botanical Gazette* for November 1896 (pp. 418–420) :—

"In view of an evident lack of correct information regarding the recent change in the custody of the National Herbarium, it has seemed desirable that a brief sketch of the present relationship and work of the division of botany of the United States Department of Agriculture and the herbarium be presented to your readers.

"During at least the past three administrations, covering a period of nearly 12 years, there has been a feeling among the authorities of the Department of Agriculture that the Division of Botany should be relieved of the custody of the National Herbarium, that institution having grown beyond a mere consulting herbarium to the dimensions of a great governmental repository of botanical collections, thereby becoming a fit charge for the Smithsonian Institution. As a result of negotiations between the two establishments, the herbarium was transferred about two years ago from the Department of Agriculture to quarters in the fireproof building of the National Museum, which is under the direction of the Smithsonian Institution, the department, however, continuing to furnish the money for its maintenance. But on July 1, 1896, the museum assumed complete charge of the Herbarium, being enabled to provide for it through an increase of $10,000 in the appropriations of the museum, added by Congress for this special purpose. The disbursement of this sum for the National Herbarium is made, therefore, through the Smithsonian Institution. Two assistant curators, Dr. J. N. Rose and Mr. C. L. Pollard, have been transferred from the Department of Agriculture to the Museum, with the necessary clerical help, and a new assistant curator of the cryptogamic collections, Mr. O. F. Cook, appointed, the botanist of the Department of Agriculture, Mr. Frederick V. Coville, continuing to serve, without salary as curator. Provided with a force of ten people, in addition to the curator, situated in fireproof quarters and managed by the Smithsonian Institution, the National Herbarium is now favourably situated to continue its development as the repository of the botanical collections acquired by the various branches of our government.

"The Division of Botany in the Department of Agriculture has now a force of twenty persons, including clerks and labourers, and funds to the amount of $29,000 available for the expenditures of the present fiscal year. Mr. Frederick V. Coville is botanist and chief of division and is especially engaged in work upon the native plant resources of the United States and upon the geographic distribution of plants. Mr. G. H. Hicks is assistant chief and has special charge of seed investigations and the laboratory equipped for that purpose. Mr. L. H. Dewey has charge of all matters relating to weeds, information about the damage done by them, their present distribution and means of dissemination, ways of holding them in check, and warnings about newly introduced species.

"Mr. V. K. Chesnut has charge of the pharmacological laboratory and conducts investigations on poisonous plants, more particulary those native species which are a common cause of poisoning in man or

domestic animals. Mr. A. J. Pieters has charge of the anatomical and photographic work of the division and is conducting a special series of experiments on the germination of weed seeds. Mr. W. W. Tracy, recently appointed from the seed farm of D. M. Ferry & Co., has charge of greenhouse and outdoor tests of seeds and of the cultivation of native food and other economic plants. Mr. J. C. Dabney is assisting in experiments in seed selection, and is making studies of the effect of various chemicals upon germination. Mr. Sothoron Key has charge of laboratory germination tests, and is conducting practical trials of the relative merits of various kinds of laboratory apparatus. Mr. John B. Leiberg is carrying on the greater part of the field work connected with the special studies of the botanist. Mr. F. A. Walpole is the artist of the division, recently appointed after passing the highest examination among 21 competitors.

"The Division of Botany as at present organised is an establishment equipped with the best scientifically trained men obtainable, and with the best modern appliances for the investigation of agricultural botanical problems."

DLXII.—COMPLETION OF FLORA OF BRITISH INDIA.

The issue of the twenty-second part concluding the *Flora of British India* was recorded in the *Kew Bulletin* for December last. The following correspondence which has been officially addressed to Sir Joseph Hooker deserves to be placed on record as a recognition of his services in this and other fields of usefulness to India:—

India Office to Sir J. D. Hooker.

India Office, London, S.W.,
May 31, 1897.

Sir,

I am directed by the Secretary of State for India in Council to forward copy of a letter, in which the Government of India express their satisfaction at the completion of your *Flora of British India*. Lord George Hamilton desires heartily to associate himself with the Government of India in their acknowledgment of the valuable services you have done to India by this great work, and by your labour in the field of Indian botany, since you first visited that country nearly 50 years ago.

I am, &c.
(Signed) A. Godley.

Sir Joseph Hooker, K.C.S.I., C.B., F.R.S.

Government of India to Secretary of State.

My Lord,
Simla, April 21, 1897.

We are informed by our Director of the Botanical Survey of India that the *Flora of British India*, which was begun by Sir Joseph Hooker some 25 years ago, has just been brought by him to completion. The value of the work as a contribution to pure science has already been appreciated and acknowledged by others who are more competent to speak in such a matter than ourselves. But we desire to express our hearty recognition of the service to India which Sir Joseph Hooker

has rendered by his monumental undertaking. He has for the first time brought the botany of the empire into a collective form and placed it upon a firm and lasting basis, thus completing the work which he began nearly half a century ago in the Himalayas. We would ask your Lordship to convey to Sir Joseph Hooker our high appreciation of his labours, and of their value and importance as systematising and adding to our knowledge of the vegetable productions of India; and our hearty congratulations upon having brought to a satisfactory conclusion a work to which he has devoted so many years of his life.

We have, &c.
(Signed) ELGIN.
G. S. WHITE.
J. WESTLAND.
J. WOODBURN.
M. D. CHALMERS.
E. H. H. COLLEN.
A. C. TREVOR.

The Right Hon.
Lord George F. Hamilton,
Her Majesty's Secretary of State
for India.

DLXIII.—MISCELLANEOUS NOTES.

In the premature death of Mr. J. THEODORE BENT, the distinguished traveller, geographical and botanical science have sustained a grave loss. It occurred suddenly just as he had reached London from his last expedition to Sokotra and Southern Arabia. A chill caught on the way home brought on acute pneumonia, and he died on May 5, at the early age of 45 years.

Mr. Bent and his wife, who was his constant companion, were intrepid travellers in the East, in Arabia, and in Africa. The interesting botanical results of their memorable journey to Hadramaut (in 1893–4), on which they were accompanied by Mr. William Lunt, a member of the staff of the Royal Gardens, are given in the *Kew Bulletin* for 1894 (pp. 328–343). Those of their second journey in Arabia Felix in 1894–5, were published in the *Kew Bulletin* for 1895 (pp. 180–186). The materials they obtained brought out clearly the relations of the Flora of Southern Arabia to Africa on the one hand, and to Western Asia on the other. They returned last winter to the same region, visiting in addition the island of Sokotra. But the plants they obtained have not yet been worked up.

Mr. Theodore Bent possessed a singular charm of manner, and an eager intelligence. His own object in travel was mainly archæological. But he was keenly anxious to assist any other branch of science to which he could be of use.

Botanical Magazine for April.—The plants figured are *Agave Haseloffii*, *Gentiana tibetica*, *Tristania laurina*, *Gongora tricolor*, and *Senecio Smithii*. The *Agave* is a Mexican species which has been in cultivation at Kew for many years, and flowered for the first time in 1895. The *Gentiana* is a tall-growing species with leaves sometimes 18 inches long. The plant figured was raised from seed supplied by

the Royal Botanic Gardens, Calcutta. *Tristania laurina,* from Eastern Australia, has been grown at Kew for a considerable time, but the specimen drawn for the *Magazine* was furnished by Thomas Hanbury, Esq., of La Mortola. *Gongora tricolor* is a native of Costa Rica, whence the Kew plant was sent by the late Mr. R. Pfau. The fine *Senecio* was first discovered by Banks and Solander in Tierra del Fuego during Cook's first voyage. It has since been found in South Chili, and seeds, from which the plant figured was raised, have been sent to Kew from the Falkland Islands, where they had been collected by Mr. A. Linney, of the Government Gardens.

Botanical Magazine for May.—All the plants figured are in cultivation at Kew. *Agave kewensis,* from Mexico, flowered for the first time in the Royal Gardens in 1895. *Maxillaria houtteana* is a native of Guatemala and Venezuela. The plant figured was obtained from the Brussels Botanical Garden. *Syringa amurensis* is a privet-like plant from North China and Japan. Professor Sargent, who had introduced it from the latter country into America, sent plants to Kew. *Dimorphotheca Ecklonis* was raised from seeds supplied by Mr. William Armstrong, of Port Elizabeth, where it occurs wild. *D. Ecklonis* differs from all the other species figured in the *Botanical Magazine* in having a shrubby stem. *Gomphocarpus setosus,* native of Southern Arabia, has but little merit as a garden plant. Seeds from which the plant figured was raised were collected by Mr. Lunt during the Hadramaut Expedition in 1893.

Hooker's Icones Plantarum.—Parts one and two of the sixth volume of the fourth series (plates 2501–2550) have appeared. Two new genera are figured, namely, *Efulensia* (Passifloraceæ) and *Campylogyne* (Combretaceæ). The former is a native of West Tropical Africa, where it was discovered by our correspondent, Mr. G. L. Bates, and it is nearly allied to *Crossostemma,* differing in having compound leaves and free styles. *Campylogyne,* from the same country, had been erroneously referred to as *Cacoucia. Dorstenia arabica,* Hemsl., is a singular species having a fleshy stem and bullate, shining leaves. It was one of the discoveries of the late Mr. Bent. *Calvaria major,* Gaertn. f., is an exceedingly interesting sapotaceous type from Mauritius. Seeds of *C. hexangularis,* Gaertn. f., a species which has not been identified with any existing tree, were found embedded with bones of the Dodo. *Echinops bromeliæfolius,* Baker, is remarkable for its foliage and very long cylindrical receptacle. *Sacoglottis amazonica,* Mart. (Humiriaceæ), is the source of a "drift-fruit" figured and described three centuries ago. *Tradescantia orchidophylla,* Rose and Hemsl., has large orbicular leaves lying flat on the ground, and a few shortly stalked flowers clustered in the centre. *Glossostemon Bruguieri,* Desf., is a member of the Sterculiaceæ inhabiting Mesopotamia and the neighbouring countries, having a large spiny fruit, until now imperfectly known. Finally there is a series of about a dozen plates of figures of Mexican species of *Eryngium,* exhibiting a great range of variety in habit, foliage, involucre, and fruit, the last both in appendages and in cross-section.

Tibetan Plants.—Two additional collections of dried plants have been received from Tibet, which is becoming more and more the field of active exploration. One of these was made by Captain Wellby and Lieutenant Malcolm during a journey across Tibet between 35° and 36° N. The other was obtained by Captain Deasy and Mr. Arnold Pike when travelling in Western Tibet. Both collections exhibit the stunted vegetation so characteristic of this flora. Selections from both have been exhibited at the Royal Society's Conversazione, where they attracted much attention.

Primula farinosa in the Andes.—The isolated position of a species of *Primula* in Tierra del Fuego and the Falkland Islands, whether regarded as specifically distinct from the northern *P. farinosa* or not, has been commented upon by most writers on botanical geography. Sir Joseph Hooker (*Flora Antarctica*, ii. p. 337) specially alludes to the absence of the genus, so far as then known, from all parts of the Andes, and the fact that no species had been found in North America in a lower latitude than 39°. Since then two species have been discovered in the mountains of Arizona and New Mexico, and now Prof. F. Philippi, the director of the botanic garden at Santiago, has sent specimens of the South American species from two distant localities in the Chilian Andes. One is from the Cordillera del Rio Manso in 41° 30′ S. lat., and the other from the Cordillera de Araucania in 39° S. lat. But Kew previously possessed a specimen of *Primula farinosa* from Chili, though the fact seems not to have been recorded before. This specimen was collected by Mr. Pearce, a traveller in the service of Messrs. James Veitch & Co., in the Cordillera de Ranco, midway between the other two localities, and was presented to Kew in 1884.

The South American specimens represent both large and small-flowered varieties; one of those from the Andes having flowers nearly or quite an inch in diameter.

Ceylon Flora.—The untimely death of Dr. Trimen unhappily left his admirable *Handbook to the Flora of Ceylon* in an unfinished state. Two volumes still remain to be written in addition to the three already published. Sir Joseph Hooker has most generously offered to undertake the preparation of these, and his offer has been accepted by the Government of Ceylon. The necessary materials and specimens have already been received at Kew from the Royal Botanic Garden, Peradeniya. More than thirty years ago Sir Joseph Hooker assisted Dr. Thwaites in his *Enumeratio Plantarum Zeylaniæ.*

Aids to Colonial Development.—The following is an extract from an article which appeared in the *Journal des Débats* for March 20 last, and of which a translation appeared in the United States Consular Reports for May (pp. 162–163):—

"A nation that desires to form colonies will find that the conquering of the territory is hardly the beginning of her task. The resources of the country must be studied and appraised; the agricultural and geological map of the land must be prepared; the soil must be analyzed, native

plants catalogued, foreign ones introduced, the best selected, and, finally, methods adopted to in every way advise and assist the colonists.

"The botanical gardens of our colonies were formerly rich in plants and cuttings, which were generously distributed. Unfortunately, the same cannot be said to-day, and our rivals (England and Holland) could teach us useful lessons. The Dutch have organized at Buitenzorg, Java, a first-class establishment, where plants are cultivated whose products can be used in the industries, such as rubber and camphor trees, gum plants, &c. These are introduced into the neighbouring Dutch colonies. Laboratories have been established, pamphlets are published, and photographs prepared to advertise the useful plants of the colonies and their products.

"The English have accomplished still more. The large botanical garden at Kew, known all over the world, is in correspondence with eighty similar establishments in English possessions—India, Guiana, Canada, Ceylon, &c. From each Kew receives plants, seeds, &c., which are cultivated with great care, not only in samples, but in sufficient number to be sent later to other colonies. The Germans, at Berlin, and the Belgians at Jembloux, have similar institutions.

"There is nothing more difficult than to transport plants, and, on the other hand, nothing more useful. The majority of industrial productions which constitute to-day the wealth of colonies are imported. Is coffee cultivated only in its cradle, Arabia? Has not the cacao tree, first found in Mexico, been carried to Java, and the vanilla plant, of the same place, to Réunion. The advantage of transporting jute, now the monopoly of India, rubber, quinine, gum, and clove-producing trees, as well as ornamental plants, to climates where the conditions would be favourable, is obvious. It will be found, however, that very few seeds retain their germinative quality long enough to permit a change of locality, especially when the voyage is of some duration, for instance, from Indo-China to the Antilles or the Congo. The plants themselves are too delicate to be transported. A botanical garden that can receive them and allow them to recuperate, as it were, from the voyage, before continuing to their destination, is indispensable to scientific agricultural development of the colonies."

Fodder Plants in British Guiana.—In the Report for the year 1895-6 by the Superintendent of the Botanic Gardens at Georgetown, British Guiana, attention is drawn to the unsuitability of Alfalfa, the Spanish name of the plant known in this country as Lucerne (*Medicago sativa*) for cultivation in tropical countries. The experiment in British Guiana entirely failed. This is confirmed by trials in similar situations in other parts of the tropics. On the other hand interesting particulars are given of crops that have been entirely satisfactory. These are described as follows:—

A plot of Bahama grass (*Cynodon Dactylon*, Pers.) taken from one of the lawns, that had never been manured, in 12 mowings in the year, gave an aggregate of 22 tons an acre.

Para grass (*Panicum muticum*, Forsk., P. barbinode, *Trin.*) that had been reaped on the same ground for several years in succession, without manure, ploughing, or replanting, in five mowings in the year gave 41½ tons per acre.

Guinea grass (*Panicum maximum*, Jacq.) on a rich piece of land, though not specially prepared for this trial, gave in five crops in the year, 107 tons per acre.

Maize in two crops for the year gave nine tons per acre. This was specially sown.

A highly nutritious native pea plant, *Phaseolus semi-erectus*, L. (widely distributed in tropical America) of which cattle are ravenously fond, gave, self-sown, without cultivation, in two crops in the year, a total of over 27 tons per acre.

Alfalfa (*Medicago sativa*, L.) in two crops for the year, gave only a total of 400 lbs.

The Rose of Jericho.—The plant commonly known as the Rose of Jericho is *Anastatica hierochuntica*, L., and that it has borne that name for centuries is proved by the fact that it is figured and described as such by nearly all the early herbalists. Lonitzer (*Lonicera*), the first edition of whose *Kreuterbuch* appeared in the middle of the sixteenth century, writes of it as a well known foreign herb, bearing the names Rosen von Hiericho, Rosa Hierichuntis, Rosa S. Mariæ, and Rosa Hierosolimitana. Several other sixteenth century authors write more fully on it. But it is now claimed that *Asteriscus pygmæus*, Coss. et Dur. (Compositæ), is the true Rose of Jericho. The Abbé Michon, who accompanied De Saulcy on his travels in the East, describes (*Voyage Religieux en Orient*, vol. ii., p. 383) a plant under the name of *Saulcya Hierochuntica*, which he regarded as the true Rose of Jericho of the pilgrims of the Middle Ages, because it is introduced into the arms of several French noble families. Boissier (*Flora Orientalis*, iii., p. 179) identified *Saulcya* with *Asteriscus*, and cites Michon's opinion as to its being the true Rose of Jericho. Here the matter rested apparently until 1882, when Dr. P. Ascherson brought the subject before the Botanischen Vereins der Provinz Brandenburg (*Verhandlungen*, xxiii., p. 44). More recently (1886) Dr. G. Schweinfurth has written on "La Vraie Rose de Jericho" (*Bull. de l'Inst. Egypt.*, 2me série, n. 6, pp. 92–96), where, according to Just (*Bot. Jahresber.*, 1886, 2. p. 196), he recognises *Asteriscus pygmæus* as the plant. This covers a wider geographical area than the *Anastatica*, ranging from Algeria to Baluchistan, and it is very abundant in the neighbourhood of Jericho. In *Asteriscus* it is the involucral leaves especially that are hygroscopic, being closely incurved over the fruit in a dry state and quickly opening out to an almost horizontal position under the influence of moisture.

ROYAL GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

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DLXIV.—MARRAM GRASS.

(*Ammophila arundinacea*, Host.)

Marram grass is a native of the shores of Europe and North Africa. It is the most important grass for binding moving drift sands. It may be propagated either from portions of the roots or from seed, and is the subject on this account of occasional enquiry. It has been successfully introduced into Australia, on the recommendation of the late Sir Ferd. von Mueller, K.C.M.G., and proved most satisfactory. The following detailed account of it, prepared by Mr. J. H. Maiden, F.L.S., Director of the Botanic Gardens at Sydney, New South Wales, is taken from the *Agricultural Gazette* for New South Wales, vol. vi., pp. 7–12 :—

A committee of the Legislature, appointed in 1852 to enquire into the means of preserving Cape Cod Harbour, in Massachusetts, in speaking of the beach between the ocean on the north and the channel of East Harbour, which is all that prevents the sea from breaking over into Cape Cod Harbour, says :—This tract consists of loose sand, driven about by every high wind, which throws it up in heaps like snow-drifts. The wind from any point from north-east to north-west, drives the sand directly from the beach into the channel of East Harbour, and is carried by a strong current into the north-west part of Cape Cod Harbour. The ocean on the north is wasting this narrow beach away in every storm, and the current in East Harbour channel undermining and destroying it on the south. The decay of the beach has been on the increase for several years ; it has narrowed within seven or eight years, by the tide that runs through East Harbour channel, from eight to ten rods. Where the mail stage travelled only one year since, is now the channel, with 6 feet of water at low tide, and from 12 to 14 feet at high water."

The first effort made by the State for the preservation of this important harbour appears to have been in 1714. The town was incorporated in 1727, and was at that time a place of some extent ;

but the inhabitants soon began to leave, and in less than twenty years it was reduced to two or three families. After the Revolution the place revived, and is now a thriving town.

The object of the law of 1714 was to arrest the destruction of the tree and shrubbery on the province lands, and on the preservation of which it was thought the harbour depended, as they prevented drifting of the sand.

In 1824 commissioners were appointed by the State Government to examine the subject, and report what action was necessary to prevent the rapid destruction of the harbour. They recommended an Act to prevent the destruction of beach-grass, and reported that the sum of 3,600 dollars would be necessary to set out that plant, make fences, etc. The Legislature in 1826 applied to Congress for that sum, and Congress has, at different times, made appropriations to the amount of about 38,000 dollars, which seem to have failed, in some measure, to accomplish the object intended, and East Harbour is still rapidly filling up.

Many years ago, it was as customary to warn the inhabitants of Truro, and some other towns on the Cape every spring, to turn out to plant beach-grass, as it was in the inland towns to turn out and mend the roads. This was required by law, with suitable penalties for its neglect, and took place in April.

A farmer of much practical knowledge concerning this subject, says :—" Since the cattle have been kept from the beaches, by the Act of the Legislature of 1826, the grass and shrubs have sprung up of their own accord, and have, in a great measure, in the westerly parts of the Cape, accomplished what was intended to be done by planting grass. It is of no use to plant grass on the high parts of the beach. Plant on the lowest parts and they will rise, while the highest places, over which the grass will spread, are levelling by the wind. To preserve the beach it must be kept as level as possible."

Beach-grass is of little value, except to prevent our loose sandy beaches from being drifted about by the wind. We have but one species, and this is fast spreading over our upland, making it useless for cultivation. Land that would produce from 20 to 25 bushels of Indian corn to the acre, without any manure, twenty-five or thirty years ago, is now overrun with beach-grass, and will produce nothing else. If the dead grass is burnt off in the spring, it will make a pretty good pasture for cattle and horses. It keeps green longer than any grass we have. It can be cultivated from the seed or by transplanting. Our loose sandy beaches are the most suitable for its growth.

Beach-grass seems to require the assistance of some disturbing causes to enable it to attain its full perfection. The driving winds in some localities are sufficient, while in other places, where it does not thrive so well, it is probable that an iron-tooth harrow would greatly improve and aid its growth. (Flint, *Grasses and Forage Plants.*)

While this grass has been extensively used in Europe, probably for centuries, for binding coast sands, it does not appear to have been introduced into Australia for the purpose until recently.

The seed of the Marram grass was first introduced into the Colony of Victoria by Baron von Mueller in 1883, and by him

entrusted to the Borough Council of Port Fairy for experiment on the barren shifting sand-hummocks fronting the coast line of Port Fairy. It has proved to be the most effectual sandstay ever planted. Practical evidence of its value can be seen in the 50 miles of sandhills extending between Warrnambool and Port Fairy, now reclaimed by the Marram plantations, sown under the direction of Mr. S. Avery, the park ranger. So complete has been the reclamation of the lands, that where a few years ago not a sign of vegetation was to be seen, there now exists a succulent grass eagerly devoured by cattle, and growing to a height of 4 feet. Marram grass is practically indestructible—burning, cutting, or eating off only makes it thrive—while in exposed shifting sand it propagates as surely as in the most sheltered situations.

The grass is planted in rows at a distance of 6 feet apart, the space between the plants at least 2 feet. The depth to which each plant is put into the sand depends upon the nature of the sand. If in sand not likely to drift for two or three months, 9 inches is deep enough ; but if very loose and shifting, the grass should be placed from 12 to 15 inches deep. A "plant" consists of as much grass as a man can conveniently hold in his hand, and care is taken to have the roots regular. The system adopted in planting is for one man to dig the hole, and another man puts in the plant, around which he well treads in the sand. After twelve months' growth the plants are fit for thinning out and transplanting.

Cattle are not allowed to graze on the grass until the roots become thoroughly established. It takes 3,630 "plants" to the acre ; and there are about 2,800 "plants" to the ton, thus 1 ton 6 cwt. covers one acre. The most favourable time for plants is from 1st May to end of July. The grass retains its vitality, and strikes root after being out of its sand-bed for three months or more. (*Melbourne Leader*, 2nd December, 1893.)

Marram grass commences to flower in November with us. It flowers in July in England.

The following account of the attempts to acclimatise the grass at the Cape are instructive :—

As a specimen plant, *Ammophila* was introduced some years ago into the Botanic Gardens, Cape Town, by Professor MacOwan, and seed obtained from Lincolnshire, England, was sown on the D'Urban Road sands by Mr. Lister. The grass is said to have grown well. It was naturally killed by the Port Jackson wattles sown with it, and it was afterwards abandoned as a temporary stay in favour of the native Pyp grass.

At Eerste River sands, 56 lbs. of seed obtained from Vilmorin & Co., Paris, were sown *in situ* in 1893. The seed germinated only at the foot of the sandhill experimented upon, and from a small patch, not much larger than a good-sized dining-table, 650 bundles of thinnings were taken. These have been transplanted on one-sixth of an acre of sand, in rows 6 feet by 2 feet apart, in accordance with the method described below. Other two-year-old plants will enlarge the Marram Nursery to about half an acre, and one-year-old plants have not been thinned.

The larger plants removed were fully 4 feet high, and thus, with the advantage of Cape Town refuse manure, have attained

in two years, from seed, a growth equal to three-year-old transplants at Port Fairy. That Marram grass is not readily raised from seed appears to be shown in the demand made upon the Victorian plant supplies by other Australian colonies, Africa, and India; but once germinated it seems to thrive amazingly. The actual yearly increase is not stated in the Port Fairy report. From the prolific growth of the limited number of plants at the Eerste River, it is probable that, in favourable situations, and with manure, it will quadruple itself annually.

In a few years thinnings should be available for distribution. To avoid heavy transport charges on large quantities of plants, probably the best plan would be to form a small nucleus plantation of one or two acres at a sheltered spot near the sands to be reclaimed. If such a plantation of 2 acres in one year doubled itself only, in six years sufficient plants would have been produced to reclaim 128 acres of sand. The probability is, however, that the increase would be more rapid.

The first essential measure to success appears to be the fencing in of the sands, to exclude cattle before the grass is mature, and to protect it afterwards in the dry season. The cost per acre of fencing will vary considerably, according to the shape of the sands and their geographical position. On the coast, for instance, with an ocean boundary, one side of the sands would be naturally protected, whereas an inland sand might require fencing on three or more sides.

To arrive at an estimate from which to make local calculations, let us assume a sand-drift to be 1 mile long and half a mile broad—say, 320 acres in extent. Fencing can be erected in most parts of the colony for £50 per mile, or less; say, £150 for the 3-mile boundary, or about 10*s*. per acre. Holes can be made in the sand, and the plants conveyed from the nucleus plantation and put in for £1 per thousand, say, 3,500 plants per acre, equal £3 10*s*. Allowing 5*s*. per acre for direct supervision, an ample charge on extensive works, a total cost of £4 5*s*. per acre is arrived at, and on 320 acres would cost £1,360 to protect and plant.

If a plough were used for drawing a planting furrow, and closing it again, the cost might be considerably reduced—(*Journal, Department of Agriculture, Cape Town*, 26th July, 1894).

This grass has been extensively planted by the New South Wales Department of Agriculture at the sand-drift at Newcastle, in conjunction with the Maritime Pine (*Pinus maritima*), and the vexed question of how to deal with this drift, which, in times gone by, has been such a source of expense and anxiety, appears to be in a fair way for settlement. The grass is flourishing splendidly, the area under the grass is increasing year by year, and quantities of the grass are each winter season sent away to public bodies and private individuals (in this and other colonies), who desire to resist the encroachments of coast sands. Following is an extract from a letter received from a correspondent supplied by the department, with specimens of the grass for experimental purposes:—

"I beg to report on the success of the experiment to grow Marram grass at Shell Beach, Middle Harbour, where the rootlets

you kindly obtained for me some months back have been growing splendidly, and already throwing out shoots 3 to 4 feet away from the main stems. My friend who planted the roots states that he put in a handful of manure with each root, which, no doubt, assisted the quick growth of the grass, which is now about 2 feet in height, and of a deep green colour.

"Some rootlets that I planted at the same time as the above at Edward's Bay, Middle Harbour, have unfortunately been eaten down by cattle.

"I would strongly advise your department to plant the Marram grass along the Spit Road beach, Middle Harbour, where, if protected during the first year from cattle, it would afford protection to the embankment along the road to the ferry, and also assist in reclaiming an extensive flat on the Pearl Bay side of the Spit."

The department will be glad to supply experimental quantities of the grass to persons willing to plant it in suitable localities. There is no doubt it is far more efficient as a sand stay than the native *Spinifex hirsutus*.

In a report upon the grazing capabilities of the grass furnished to Baron von Mueller, by Mr. Avery, from Port Fairy (November 18th, 1893), he states:—

"I generally put the cattle into the Marram grass enclosure after the first rains we get in April, and then allow them to graze there until the season begins to get too dry, when they are taken out and kept off till next season. I have been able to keep them longer in this season on account of the late rains we have had. During the last season I have had about 100 head of cattle grazing on about 100 acres of Marram grass for six months, and the cattle kept in fair condition during that time. There seems to be some doubt in the minds of a great many persons who have heard about Marram grass that it is of no value as a fodder, but I can assure you that the cattle at Port Fairy thrive well on it, and if it was not for this grass during the winter months the residents' cattle would fare badly. I am of opinion that it would make a splendid ensilage (*Melbourne Leader*, December 2nd, 1893)." Mr. T. E. Willis planted some Marram grass at Edward's Bay, Middle Harbour, but reported that they were eaten down by cattle. Baron von Mueller (*Select Extra-tropical Plants*, 1888 edition) says:—"Like *Elymus arenarius*, not touched by grazing animals." Dr. George Vasey says:—"This grass has no agricultural value." At Cape Cod Harbour the grass does not appear to be used for grazing purposes.

These statements may be reconciled as follows:—When fully grown, the Marram grass is notoriously a strong fibrous grass, beyond the power of cattle to digest, even if they are able to masticate it, but the young growth (and even larger growth if the season be moist and favourable), can be eaten by cattle, hence the protection a Marram grass plantation requires at this most critical period of its existence. It is a matter of common knowledge that many of our native tussocky and other grasses are browsed upon by cattle, while young and fairly succulent, but, on account of their harsh and wiry nature, they are absolutely uneatable when fully grown. The use of Marram grass must always, therefore,

be very subordinate from the point of view of pasture. Its value is that of a coast sand binder.

At the same time the question of keeping cattle away from newly-farmed Marram grass plantations must never be lost sight of. Fodder in such situations is harsh and sparse, and stray cattle will readily bite at the comparatively tender Marram plants just coming into growth, and perhaps exterminate a plantation unless checked.

I have since received the following letter from Mr. S. Avery, of Warrnambool, Victoria, which shows that the grass is a really valuable fodder grass :--"The Marram grass is edible during the whole of the year, and cattle will eat it at any time, but while there is plenty of rye grass and clover on the flats during the spring, the cattle prefer rye grass and clover to the Marram grass, but as soon as the grass begins to get scarce on the flats, the cattle then take to the sand-hills and feed on Marram grass during the winter months, and thrive well on it. Before the Marram grass was introduced into Port Fairy, the cattle running on the flats along the sea coast used to suffer severely from scouring, and a great many used to die from that cause, but now you will never find a beast scoured that grazes on the Marram grass plantations, it being of a binding nature as well as fattening. The Marram grass will only thrive well on barren sand-drifts, where it is impossible to get anything else to grow, and the greater the sand-drifts the better it thrives, and as a sand-stay it cannot be equalled."

A native of the shores of Europe and North Africa, Dr. George Vasey states that it grows on sandy beaches of the Atlantic, at least as far south as North Carolina and on the shores of the Great Lakes, but so far it has not been recorded from the Pacific Coast. It is, however, not indigenous to the United States, though from the account which has been given of Cape Cod Harbour it will be seen that it has been thoroughly acclimatised on the American continent.

Another possible use for Marram grass is suggested in the following letter, received at Kew, from Mr. R. W. Adlam :—

Joubert Park, Johannesburg,

August 23, 1894.

SIR,

I beg to return you my best thanks for the seeds received in two bags, as noted in yours of July 26. The *Ammophila* seed is very acceptable, as I wish to experiment with it to find if it will grow on, and bind together, the sand, or tailings heaps, which are accumulating so fast along the Main reef, and around this town. Our gold output is now five tons per month, and to obtain this a vast number of tons of rock have to be crushed.

The crushed gold-beating quartz—or rather sandstone, is first treated with mercury, and thereafter with cyanide of potassium, to obtain every particle of gold.

The cyanide remains in the tailings heaps, and, of course, is strongly poisonous. Blown about by the strong winds here, the sands cause serious eye complaints, and illness.

The question is, will any vegetation grow on such poison mountains—for so the tailings heaps may well be called.

I shall value your opinion on this serious subject.

I am, etc.,
(Signed) R. W. Adlam.

The Director,
Royal Gardens, Kew.

DLXV.—AGRICULTURAL DEPRESSION.

It is a common fallacy to suppose that the state of things commonly spoken of as "agricultural depression" is peculiar to this country. It is a universal phenomenon of which the stress experienced in the United Kingdom is only a particular phase. It extends to cultural industries in every part of the world, though, from local causes, it is felt in some places more severely than in others. Nor is there any reason to suppose that it will diminish or be alleviated by palliative expedients. The causes are too deep-seated and permanent to be regarded as temporary. Mankind will, in fact, have more and more to reconcile itself to a new order of industrial conditions. The process will, no doubt, entail much individual loss and suffering. But this is inevitable, and is the accompaniment of all great changes. The problem must find its own solution, and will, in time, adjust itself.

The fundamental cause of the present state of things is the levelling influence on prices of modern facilities of transport. This includes a wide range of circumstances all conducing to the same end, and, in the long run, producing the same result. Such are :—the extension of railways, the construction of inter-oceanic canals, the use of iron for ship-building, and the application of steam to navigation.

How these causes act is well illustrated by the following extract from the American *Garden and Forest* of September last (p. 391) :—

"Since 1890 the wheat production of the country (United States) has been more than twice as great as it was in 1870, and there is no doubt that these large crops, added to the millions of bushels which are exported from India and the Argentine States, have supplied the world with more wheat than it can eat, or, at least, more than it is willing to pay for, and to this it must be added that Russia, Hungary and Spain have multiplied their production still more rapidly, while Australia threatens to put millions of bushels upon the markets of the northern hemisphere. But this is only one factor in a great change which has been going on all over the world during the last half of the century. In agriculture as well as in manufactures, science with inventions, which come from increased knowledge, have so cheapened production of every sort that the world we live in is quite a different one from the world of the early years of the present century. Machinery has so multiplied the power of a single man to cultivate and harvest and transport crops that a bushel of wheat can be raised, harvested and turned into flour in the distant west at less cost than it could be raised a few years ago in the rich

wheat-fields of northern New Jersey or Pennsylvania, and it costs actually less to put flour into the New York market from Minnesota than it cost our fathers to carry it fifty miles. With sulky-plows and horse-cultivators, with cheap fertilizers and a knowledge of how to apply them, the market-gardeners and truck-farmers of Virginia and southern New Jersey, by the aid of rapid transit, can sell fresh vegetables at a profit in this city for less money than they could have afforded to sell them on their farms a few years ago. It is owing to this cheap transportation that the fruit growers of the east are compelled to compete with a thousand car-loads of fruit brought into this city every year from California. When early apples from Canada come into competition with late winter apples from Australia in the English market, and perishable fruits like plums and peaches, raised in California, are sold in Liverpool, it is evident that the element of distance between the producer and the consumer of agricultural products is practically annihilated."

When this annihilation has been effected it is simply, in a great number of cases, a question whether the producer of any given commodity can face the competition of the world. If he can't, nothing will save him, and he must, before his capital is exhausted, devote his attention to some other industry.

Cultural industries will be limited then, in the long run, by the physical conditions of soil and climate, in the first place, and in the next, by the local cost of labour. The cultivation of the vine ceased in England, not because, as is often supposed, the climate became unfavourable, but because the produce of the ill-matured English grape could not hold its own in competition with that of France, when that became procurable. On the other hand, as already pointed out at some length in these pages (*Kew Bulletin*, 1895, pp. 307–315), vegetables, although they can be readily grown in this country, are largely imported from abroad, because the cost of production (and perhaps of transport) is cheaper. The pacification of Egypt has crippled the growth of onions in Bedfordshire.

In a few cases, but it is unlikely that they will ever be very numerous, the progress of discovery has superseded some staples altogether.

The manufacture of alizarine gave the death blow to the cultivation of madder. But synthetic chemistry has its limits, and it is improbable that mankind will ever be wholly satisfied with artificial substitutes for wine or for tea and coffee. Yet cheaper and perhaps inferior products will often press heavily on dearer and better ones. Cotton-seed oil is daily taking the place of that expressed from the olive. But economy is a more exacting factor in consumption than the gratification of a cultivated palate.

DLXVI.—FAT HEN IN AUSTRALIA.

(*Chenopodium album, L.*)

The plant referred to in the following communication turns out to be a familiar British plant. It is very commonly met with in Europe and temperate Asia as a weed of cultivation, probably

having its original home in the latter part of the world. It has spread to many climes. Bentham (*Flora of Australia*, vol. 5, p. 160) remarks :—"Whether it be really indigenous or introduced only into Australia is uncertain. In N. S. Wales and Queensland it is said to be known under the name of *Fat Hen*."

Kiel Villa, Nelson Street, Sans Souci,
N. S. Wales, May 12th, 1897.

DEAR SIR,

I SEND herewith a small packet containing a few seeds of a native vegetable—though only treated generally as a weed. The vulgar name it has is "Fat Hen"—poultry are fond of it when young, but those who use it as an article of diet call it "Australian spinach." I don't remember ever seeing a similar plant at home. In my early days when in the "bush" far away from centres of population I have been glad to eat this and enjoy it too, being unable to obtain vegetables, and in my opinion, also of others, think it superior to spinach, as it does not taste earthy and does not waste so much in boiling. It is everywhere a hardy plant growing freely at sea-level and on the high table lands of this colony. Any soil suits it, but it revels in a sandy loam, and does well with a fair share of moisture ; the more rapidly it grows the more succulent and tender it is. Sow about the middle of May ; transplant as cabbage, and when a foot to fifteen inches high take about 6 or 8 inches off the top, the portion left will throw out abundant lateral shoots right up to early winter ; if left without topping will reach five feet high. The shoots become stringy if not taken away when young.

Hoping I have sent you something new and that it may be of use, or the means of introducing a fresh plant for food.

I am, dear Sir,
Yours faithfully.
A. R. FREMLIN.

W. T. Thiselton-Dyer, Esq.,
Royal Gardens, Kew.

DLXVII.—EUCALYPTUS TIMBER FOR STREET PAVING.

The use of Jarrah timber (*Eucalyptus marginata*) and Karri (*Eucalyptus diversicolor*) for paving carriage-ways in London, was noticed in the *Kew Bulletin* (1890, p. 188 ; 1893, p. 338). Since that time the use of these hard timbers, instead of soft woods, like yellow deal, has been extended. In the report of a Special Committee of the Paddington Vestry, appointed to consider the subject of wood paving in that important parish, the following recommendations have been made :—

28th May, 1896.

REPORT of the Special Committee appointed to Consider the subject of Wood Paving in the Parish of Paddington.

Your Committee have taken in hand the thorough investigation of the above-mentioned subject, having held four meetings, and considered carefully the evidence brought forward. Your Committee are unanimously agreed as to the imperative importance of

hard wood for public thoroughfares, and they entirely endorse the words of the Surveyor of Lambeth (J. P. Norrington, C.E.), "that it is a wicked waste of public money to pave a line of heavy traffic with soft wood."

Your Committee having seen sections of roadway paved with Jarrah, Karri, and other hard woods, subjected to most severe traffic, consider that the length of life of these woods has not been over-estimated, and that fifteen years is within the limits of trustworthy probability. Your Committee entertain very decided views as to the sanitary superiority of the Eucalyptus woods and their non-absorbent qualities.

As to the first cost of hard wood, they have had clear evidence that its great durability will not only cover the additional expense, but will realize an actual saving in the course of years, as well as make the necessity for renewals far more exceptional than can be possibly attained by the best treatment of the soft woods.

Your Committee have formed a strong opinion of the necessity of repaving Praed Street with hard wood, and that it should be so paved throughout its entire length as a whole. They also think it would be preferable to keep such thoroughfare in repair for another year rather than rush the re-paving thereof with soft wood, the material last used, according to the Surveyor's Report, having been down only for four and a half years.

The cost of maintenance of a deal wood road varies from year to year, so that whilst for the first three years the cost is very light, after four or five years it is very heavy. Thus since the last renewal in Praed Street in 1892-3, the maintenance in 1894 was £1 3s. 6d., in 1895 £10 13s., and in 1896 £73 19s. 8d., and to maintain such thoroughfare for another year will probably cost £100.

Your Committee consider the proposed experiment in Southwick Street as perfectly unnecessary in the face of the evidences afforded by the parishes inspected. They also consider change of road surface material on a permanent concrete bed to be a new work, and not in any sense a renewal, and consequently such undertakings may be met by loans if necessary.

Your Committee consider that the cost of renewing the existing soft wood paving in the parish will amount on an average to £7,000 per annum, but should hard wood be adopted they anticipate effecting a yearly saving of £2,000.

Under these circumstances your Committee unanimously recommend the use of hard wood blocks of not less than four inches in depth, for paving purposes in all suitable thoroughfares in the Parish, such blocks to be close jointed with creosote and pitch, and they further recommend that the proposal to pave Praed Street with yellow deal be reconsidered.

S. J. Mackie *(Chairman).*

The following note headed "Wood Paving at the West End" appeared in the *Daily News* for the 17th August 1897 :—

"The Vestry of Paddington have borrowed £13,000 from the London County Council for the purpose of extending wood pavements in the parish. Already about eight miles of the streets of Paddington are paved with wood, but mostly soft wood. For

reasons of durability, cleanliness, and sanitation, the Vestry have now abandoned the use of soft deal in favour of hard wood, and have accepted a tender for the supply of 850,000 West Australian hard wood blocks at £10 17s. 6d. per 1,000 blocks.

DLXVIII.—GRAFTING SUGAR CANE.

The following article, which appeared in the *Hawaiian Planters' Monthly* (March, 1897, p. 101), has been communicated by the Editor (Mr. H. M. Whitney), who describes an experiment undertaken by himself about 20 years ago, which is believed to have resulted in producing a "hybrid" cane now largely grown in the Hawaii Islands.

The hybrid is understood to have been produced by grafting buds of the well known rich Lahaina cane on the stems of a hardy native cane called the "Kouala." The hybrid is said to be generally known as "Ko Wini" or "Whitney Cane," also as the "Yellow Bamboo."

The possibility of producing a graft-hybrid in the sugar cane has been a good deal discussed, but few people, without careful verification, would be prepared at once to admit that such a cane has actually been produced. Mr. Whitney's account, which is circumstantial enough in its details, is reprinted in the *Kew Bulletin*, but it is hardly necessary to add that this does not involve an endorsement of his belief that in this instance a hybrid cane was actually produced.

Grafting of Sugar Canes.

"The question of producing hybrid canes by grafting or budding is again being discussed, as though it had not been conclusively settled already, by actual results obtained in Brazil and Hawaii. A correspondent in the *Manchester Sugar Cane* of November last (page 577) quotes an old letter written by the late Charles Darwin relative to the hybrid canes produced in Brazil some forty years ago, in which Mr. Darwin doubted the correctness of the facts published.

"We have now in our possession a copy of the original official report of the Agricultural Department of Brazil translated by Mr. C. M. Nathan, of New Orleans, and published in the *N. O. Picayune*, in 1877. The statements made in this report appear to show conclusively that a hybrid was obtained by the process of splicing or 'apposition' of two halves of different varieties—the Cayenne and Molle, from which the St. Julian cane was obtained.

"A late number of the *Queensland Sugar Journal* refers to a successful experiment in that Colony by the same process of 'apposition.' It is possible that new varieties may be obtained in this way, provided that special care is taken to have the surface of the two halves perfectly smooth so as to fit each other closely, and care be also taken to prevent the juice and meat of

the canes from souring, by carefully waxing and covering the exposed parts of the splice. But it would seem to us that the character of the offspring would naturally be that of the half on which the bud or seed was located. We hope that the results obtained in Queensland will be fully reported later.

"Now, as regards hybrid canes in Hawaii. We have at least one genuine hybrid cane, which originated in Kau, Hawaii, in 1877–78. The editor of the *Planters' Monthly*—the writer of this article—was then engaged in cane planting at Keaiwa, Kau, near where the Pahala sugar mill is located, his land being from one to two thousand feet above sea level. The Lahaina variety, which is a rich, juicy, and prolific cane, while it is unsurpassed for lowland cultivation, is not at all adapted to the highlands on either of our islands, as it is extremely sensitive to cold, and becomes short-jointed and stunted. It was therefore desirable to find a cane which would thrive on the highlands, and yield the rich juice of the Lahaina. Among the varieties of native canes growing in Kau was a favourite one, called by the natives 'Kouala' (or potato cane), from the close resemblance of its meat to that of sweet potato. This variety seemed to thrive well at an elevation of 2000 to 3000 feet, where stalks of it were found growing twelve to fifteen feet in length, and of large girth. It was cultivated around the huts of the native mountaineers, and was one of their favourite foods.

"It occurred to the writer that if a hybrid could by any means be produced, combining the rich juices of the Lahaina with the prolific growth and hardiness of the Kouala, it would render cane planting more profitable on the elevated land where he was located, and even allow the cultivation of cane to be extended to the rich plateaus still higher up. With this object in view, a small nursery or 'experiment station' was prepared and joints or 'seeds' of several kinds of cane planted in it. Special care had been taken in preparing the ground, by deep digging, mellowing the soil and mixing in old manure, to insure the young plants a vigorous and healthy start. When these young canes were sufficiently advanced to allow it, grafting and budding in various modes were commenced and carried on for several months, in the same manner as that practiced with apple and other fruit trees in New York State, where the writer spent his younger years on a fruit farm and became familiar with the process. The grafting was done with a V incision on the topped growing stalk, great care being taken to have the graft fit into the incision as perfectly as a cabinet maker would insert a piece when mending furniture. Not only must it fit in shape exactly, but the eye or seed and the root germs of the graft must retain the same place in the stalk as the section had, that was cut out. The same care was observed in the budding operations—to have the inserted section fit exactly that of the bud and rootlets taken out. Some of these graft stalks were left growing in the hills, care being taken to cut out all the eyes or seeds below the graft, and to destroy all other stalks in each hill. The same precaution was taken in the budding operation. In each case, graft wax and bandages were used, as is customary with tree grafting. Some of these grafted and budded stalks were planted in the soil as canes are usually planted.

"As was expected, many of these grafts and buds died without showing any signs of vitality, while of the thirty or forty experiments made, some ten or twelve sprouted, throwing out two or more leaves from each bud. But one after another, they wilted and died, leaving a single plant, which from the start seemed to give good promise, and rapidly developed into a healthy hill. This nursery was located in the centre of what became a hundred acre field of Lahaina cane, and when the young plants had grown so as to cover the ground, this sole survivor of the nursery began to attract notice on account of its dark and straight leaves. As time went on, it became so conspicuous that passers-by would stop and enquire the cause of this unusual sight. Its growth was quite phenomenal, and stretching up its leaves above the canes around it, it stood like a sentinel alone in the middle of the field. It finally ripened into a hill of forty-two stalks, not one of which was less than eight feet, and from that to ten feet in length, and of large girth.

"The late Charles N. Spencer, then manager of the Hilea plantation, a few miles distant, was greatly interested in this new prodigy, and obtained a portion of the stalks, which were planted on the higher lands of that plantation, where, in the course of two or three years, he had a field of two hundred acres of it growing at an elevation of 1800 feet. From six hills of his first planting, he cut 226 stalks for seed, some of the stalks being twelve feet in length. He considered it the best upland cane he had, and named it 'Ko Wini' or 'Whitney Cane.' In Hamakua it has been called the 'Yellow Bamboo,' but this is identically the same cane as the hybrid originated by the writer. It has been planted on low lands in various districts of Hawaii, but it has nowhere done so well as in its native soil and climate of Kau. But for the object intended—a profitable upland cane—it has proved a boon to Kau, its birth place and home.

"Since the above was written, we have been informed by the local officers of the Pahala Plantation (Hawaiian Agricultural Co.), that they have been so well pleased with this hybrid cane, that they prefer it to other kinds. The value that they place on it may be inferred from the statement made by the treasurer, that of the four thousand acres of cane now growing on their plantation, they have 2854 acres of Whitney cane, 512 acres of Lahaina, and 654 of Rose Bamboo. And the outcome of sugar has been raised from 4000 tons of former years to 8000 tons as their last crop, and there is a fair prospect of obtaining a 10,000 ton crop in the near future. And more than this, they have a field of this new cane planted on land above the famous land-slide or "mudflow" of 1868, at an elevation of about 2200 feet. This field is a most remarkable one, showing some of the finest cane ever seen in the district. These results are certainly very gratifying to the originator of this hybrid cane, and creditable to the intelligent management of the estate, which has utilized the valuable discovery, so as to make Pahala plantation one of the best sugar properties in this group."

DLXIX.—GRAMA GRASS.

(*Bouteloua oligostachya*, Torr.)

The following correspondence relates to a proposal to introduce the North American "Grama grass" as a fodder-plant into India.

INDIA OFFICE to ROYAL GARDENS, KEW.

India Office, Whitehall, S.W.,
August 7, 1897.

SIR,

I am directed by the Secretary of State for India to forward a copy of a Memo. regarding "Grama grass," and to ask you to favour him with your remarks on a suggestion that has been made by a Scotch settler in Mexico that this fodder should be tried in India.

I am, &c.,
(Signed) C. E. BERNARD,
Secretary, Revenue and Statistics Department.

The Director,
Kew Gardens.

MEMORANDUM by Professor Wallace.

Grama grass (*Bouteloua oligostachya*), which is so valuable as a pasture grass in Mexico, Texas, and other adjoining states, is not grown in this country. Not only is the quality of its forage excellent, and its yield abundant under favourable circumstances of soil, and climate, but it has remarkable power of maintaining its existence in arid regions subject to long periods of drought. If it could be shown that the soil and climate of India are suitable to it (and this could be done at little expense at one of the experimental stations, such as at Poona), it would form a very valuable addition to the fodder grasses of the country. It is just possible, however, that if it were once established in arable land, it might become a troublesome weed to the cultivator, owing to the power its roots have of keeping possession of the soil.

Royal Gardens, Kew,
August 12, 1897.

SIR,

I have the honour to acknowledge the receipt of your letter (R. & S. 2212) of August 7 relating to the introduction of Grama grass into India.

2. I have consulted upon the subject with H. H. Rusby, Esq., M.D., Professor of Botany and Materia Medica in the College of Pharmacy of the City of New York, a well-known American botanist, who is now making researches at Kew. I enclose a copy of a letter with which he has favoured me. I also enclose an extract from Vasey's Report on the Agricultural Grasses and Forage Plants of the United States.

3. There can be no doubt that Grama grass as it occurs under natural conditions affords pasture of great value. How far these could be imitated artificially in India is another matter, and one I confess, which does not appear to me likely to be attended with much success.

4. If the experiment is considered worth the attempt seed could no doubt be easily obtained from the United States Department of Agriculture.

I am, &c.,
W. T. THISELTON-DYER.

Sir Chas. Bernard, K.C.S.I.,
India Office, Whitehall.

Kew, August 10, 1897.

DEAR SIR,

I am pleased to state the following in reply to your enquiry concerning the value of Grama grass for introduction to India.

There are quite a number of species of *Bouteloua* to which this term has been applied, and several of them are designated by special prefixes, as Black Grama, White Grama, Sand Grama, etc. Some of the species are closely limited as to environment, while others possess a wider power of adaptation. Hence some of them have remained little known, while others have acquired a high repute as pasture and hay-grasses. The best known are *B. oligostachya*, *B. polystachya*, *B. racemosa*, and *B. curtipendula*. All are more or less noted for the avidity with which stock will eat them, as well as for their nourishing properties. Animals show the same taste for them in the field, either green or dry, and in the stall. It is a peculiar property of these grasses to retain their nourishing properties after drying standing, and after remaining for many weeks in this position, exposed to the weather, a process which reduces ordinary grasses to the worthless condition of straws. Another notable property is their ability, especially *B. oligostachya*, to subsist in arid regions, where long-continued rainless periods destroy ordinary grasses. I have observed the following peculiarity of growth which doubtless accounts in some degree for this property. A single plant is seen to extend its growth in two opposite directions, forming a little ridge. These directions gradually change so that the ridge assumes a roughly circular form, enclosing a shallow basin which must do something to conserve slight rain-falls. A third important character of the plants is that they do not require the formation of a continuous sod, or turf, to maintain their condition. They are thus better adapted than many grasses to grow in those countries where sods or turfs will not form.

The trial of these grasses in India is to be strongly recommended. It is further to be recommended that a preliminary study should be made of the conditions of the locality where each is to be tried, so that failure may not result from planting the several species in unsuitable locations. The Black Grama is particularly adapted to rocky places, especially mountain-sides and the slopes of valleys. The White Grama (*B. oligostachya*) is most luxuriant in the rich loam of bottom-lands. It does very well, however, as does *B. curtipendula*, on desert plateaus, with gravelly or partly gravelly soil. *B. polystachya* is a much lower grass than the others, but makes a very dense growth and does remarkably well on sands of river-bottoms which are annually overflowed. It is the most valuable sheep-fodder of them all.

It is remarkable for the rapidity with which it is restored by growth as it is continually eaten off. Indeed, all the species are remarkable for the quickness with which they grow and mature upon the occurrence of rain.

My experience with these grasses as weeds in cultivated lands is slight, but it would tend to indicate that it is not their nature to act as weeds, or to persist in tilled lands.

Very respectfully yours,
(Signed) H. H. RUSBY.

The Director,
Royal Gardens, Kew.

EXTRACT from Vasey, *Grasses of United States*, Ed. 2, p. 57.

Bouteloua oligostachya (Grama grass; Mesquite grass) is the commonest species on the great plains. It is frequently called Buffalo grass, although that name strictly belongs to another plant (*Buchlöe dactyloides*). On the arid plains of the west it is the principal grass and is the main reliance for the vast herds of cattle which are raised there. It grows chiefly in small, roundish patches closely pressed to the ground, the foliage being in a dense, cushion-like mass. The leaves are short and crowded at the base of the short stems. The flowering stalks seldom rise over a foot in height, and bear near the top one or two flower spikes, each about an inch long, and from one-eighth to one-quarter of an inch wide, standing at right angles like a small flag floating in the breeze. Where much grazing prevails, however, these flowering stalks are eaten down so much that only the mats of leaves are observable. In bottom-lands and low, moist ground it grows more closely, and under favourable circumstances forms a pretty close sod, but even then it is not adapted for mowing, although it is sometimes cut, making a very light crop. Under the most favourable circumstances the product of this grass is small, compared with cultivated grasses. It is undoubtedly highly nutritious. Stock of all kinds are fond of it, and eat it in preference to any grass growing with it. It dries and cures on the ground so as to retain its nutritive properties in the winter. No attempt is made by stockmen to feed cattle in the winter; they are expected to "rustle around," as the phrase is, and find their living; and in ordinary winters, as the fall of snow is light, they are enabled to subsist and make a pretty good appearance in the spring; but in severe winters there are losses of cattle, sometimes very heavy ones, from want of feed.

DLXX.—FLORA CAPENSIS.

The third and concluding part of the sixth volume of the work was issued in June.

The following extracts are given from the preface :—

The third volume of the *Flora Capensis* was published in 1865. The following year Professor Harvey, who had been its principal author and guiding spirit, died. Although in the preface the fourth volume is referred to as "shortly to be in preparation

for the press," practically nothing available relating to it was found amongst Professor Harvey's papers. Nor did his coadjutor, Dr. Sonder, who died in 1881, undertake any further part in the work.

Its continuation was urged upon Kew by Sir Henry Barkly, G.C.M.G., K.C.B., F.R.S., who was Governor of the Cape of Good Hope from 1870 to 1877. During a long official career in different parts of the Empire, this enlightened administrator, himself an ardent naturalist, never failed to foster the scientific interests of the colonies committed to his charge. Sir Joseph Hooker, at that time Director of the Royal Gardens, entrusted the task of continuing the work of Harvey and Sonder to me. But the pressure of official duties in which I almost immediately found myself immersed, left me little time for the task. It became evident that it could only be accomplished by the co-operation of numerous workers. Another difficulty was the rapid expansion of British South Africa. This led to a continuous influx to Kew of new material, which had to be determined and made available for future working up in the Flora. It was soon obvious that it would be necessary to largely extend the area comprised by the published volumes, and it was ultimately determined to do this still further so as to include, as far as possible, all known flowering plants occurring in the area between the Tropic of Capricorn and the Ocean. To the north, the present and future volumes will therefore be supplemented by the *Flora of Tropical Africa*.

During the last twenty years the time of one member of the Kew staff has been almost exclusively occupied with the determination of South African plants. Upwards of 10,000 specimens have been named and catalogued for South African botanists and collectors, and a considerable number have been figured and described. These labours were a necessary preparation for the continuation of the Flora on its extended scale.

For reasons of convenience it has been found advisable to publish the present volume in anticipation of the fourth and fifth, which are also in preparation, and to which it is hoped that Mr. Bolus, the well-known South African botanist, who has paid several visits to Kew for the purpose, will largely contribute. The present instalment will be found probably of more than ordinary interest to horticulturists as well as to botanists, as it includes the whole of the plants known familiarly as "Cape Bulbs."

The volume has been in preparation for several years, but its publication has been from time to time delayed by the desire to include in it the novelties which have been continually received and published as new territories have been explored.

Even while passing through the press sufficient have accumulated to render an appendix necessary. The whole has been elaborated by Mr. John Gilbert Baker, F.R.S., the Keeper of the Herbarium and Library of the Royal Gardens, who has long been the accepted authority on the Petaloid Monocotyledons. I must add my obligations to Mr. C. H. Wright, Assistant in the Herbarium, who has greatly helped me in reading the proofs.

The distribution of the localities under the different regions has been a laborious and intricate task. It will afford a basis for at any rate a partial analysis of the Flora of South Africa, which

will no doubt bring into prominence important facts as to its geopraphical distribution. It has been accomplished with much care and patience by Mr. N. E. Brown, A.L.S., Assistant in the Herbarium of the Royal Gardens. And finally it has been subjected to the invaluable revision of Mr. H. Bolus.

The orthography adopted for the local names has met with some criticism from South African botanists. It has been thought advisable, however, to adhere to the standard, no doubt in great measure conventional, of authoritative maps. Those which have been relied upon principally are :—

Cape of Good Hope. By J. Arrowsmith, 1834. (Useful for old names of localities.)

A Map of the Colony of the Cape of Good Hope and neighbouring Territories. By A. de Smidt, 1876.

Map of the Transvaal and the surrounding Territories. By F. Jeppe, 1880.

Spezial-Karte von Afrika. Gotha : Justus Perthes, 1885.

It only remains to follow the example of my predecessors, and give some account of those among a great body of contributors who have supplied Kew with the most important recent collections.

Two names will be for ever memorable in the history of South African Botany.

More than thirty years have rolled away since Professor Harvey bore eloquent testimony to the indefatigable services of Peter MacOwan, Esq., B.A., F.L.S., then Principal of Shaw's College, Grahamstown, now Government Botanist. Time has not staled his enthusiasm for the beautiful Flora amidst which he has spent the best years of his life, nor his energy in investigating it. Without his self-sacrificing aid the present undertaking would have been miserably incomplete. By a correspondence which has never intermitted, he has done all in his power to keep Kew abreast of the progress of botancial discovery in South Africa. And he possesses the happy art of communicating some touch of his enthusiasm to others, and has thus secured the investigation of many parts of the area of the Flora which might otherwise have remained all but unknown.

To Harry Bolus, Esq., F.L.S., the gratitude of Kew is no less due for aid and encouragement of the most varied kind. His admirable researches into the difficult problem of the geographical distribution of South African plants, and his patience and accurate investigation of the *Orchideæ* and other groups, will, it may be hoped, always ensure his close personal association with the present work. Mr. Bolus has further contributed to Kew many hundreds of specimens—a large proportion of which were new to science, and many of great interest and rarity.

At the risk of seeming to make an invidious choice amongst a formidable list of Kew contributors, I cannot but further single out the following for particular acknowledgement :—

Sir Henry Barkly, G.C.M.G., K.C.B., F.R.S., was indefatigable while Governor of Cape Colony in procuring for Kew many of the rarer and more remarkable of South African plants. He paid especial attention to those of a succulent habit. Amongst many interesting introductions to European cultivation, the remarkable tree-aloe (*Aloe dichotoma*) deserves especial mention. And it

was due to his support that the approval and aid of the Legislatures of Cape Colony and Natal was secured for the continuation of this work.

John Medley Wood, Esq. A.L.S., the Curator of the beautiful Botanic Gardens at Berea, Durban, in the Colony of Natal, and the only institution of the kind in South Africa, has investigated the Flora of Natal with conspicuous energy, and has done more than any other botanist to reveal its riches. Kew is indebted to him for large and invaluable collections.

The Rev. Leopold Richard Baur has sent to Kew a large and interesting collection of Tembuland plants, chiefly from the neighbourhood of Bazeia.

Maurice S. Evans, Esq., of Durban, has furnished collections which, though not numerically large, have proved very rich in new species.

H. G. Flanagan, Esq., has especially studied the rich local Flora of the Kei River Basin. Beautifully preserved specimens from him have reached Kew chiefly through Mr. Harry Bolus.

Ernest E. Galpin, Esq., of Queenstown, has sent collections rich in undescribed species from the Transvaal, Swaziland, and the Queenstown district.

Dr. Emil Holub contributed the entire collection made by him during his travels in South Africa between the years 1872 and 1879.

William Nelson, Esq., of Johannesburg, has sent an extensive collection of plants from the Transvaal and adjoining territory.

The Rev. William Moyle Rogers, of Bournemouth, has contributed a parcel of plants from various parts of Cape Colony, containing several novelties.

Mrs. Katharine Saunders has communicated from time to time interesting plants from Natal, Zululand, and the Lobombo Mountains.

William Tyson, Esq., of Kokstad, Griqualand East, has sent a large and interesting collection of plants from the Eastern districts of Cape Colony, Griqualand East, and Pondoland, containing numerous new species. He is commemorated in the Boragineous genus, *Tysonia.*

It only remains to add that the expense of preparation and publication of the present volume has been aided by grants from the Governments of Cape Colony and Natal.

W. T. T. D.

Kew, May, 1897.

DLXXI.—HANDLIST OF TENDER MONOCOTYLEDONS.

This further instalment of the detailed catalogues of the living collections in the Royal Gardens was issued in July. The following historical account is given in the preface of the history of the portion comprised in the present Handlist :—

The scope of the contents, which are somewhat heterogeneous, is dictated in great measure by convenience. It includes large

groups of plants of great scientific interest, which, for various reasons, are more attractive to ordinary cultivators than many which are comprised necessarily in a botanical collection. For this reason it is hoped that it may be found not less useful than its predecessors.

A few words may be said as to the history at Kew of the more important of the groups now catalogued.

SCITAMINEÆ.

An order including gingers, arrowroot-plants, and musas. It numbers some 450 species, of which 240 are in cultivation at Kew. Almost all are natives of the tropics. About 40 species are given in 1813 in the second edition of Aiton's *Hortus Kewensis*, and 139 by John Smith, Curator of the Royal Gardens, 1841–63, in his privately printed *Records of Kew* (p. 222) as forming "the Kew collection between the years 1822 and 1864."

Musa Ensete, one of the most popular representatives of the family and a conspicuous ornament of the gardens of Southern Europe, was first introduced into cultivation at Kew. In 1853 Walter Plowden, Esq., H.B.M. Consul at Massowah, Abyssinia, sent seeds from which plants were raised, one of which was ultimately figured in the *Botanical Magazine* (tt. 5223, 5224).

Strelitzia Reginæ, a beautiful plant, which almost certainly preserves an unbroken descent at Kew, was named by Sir Joseph Banks in honour of Queen Charlotte, a daughter of the Duke of Mecklenburg-Strelitz, but of which, with characteristic modesty, he allowed the elder Aiton to publish the description. Banks had introduced it to the Royal Gardens in 1773 from the Cape of Good Hope.

Strelitzia Augusta was introduced in 1791 by Francis Masson, the botanical collector for the Royal Gardens, where it has been cultivated ever since. It may have been named in compliment to the Princess Augusta, mother of George III.

The collection is dispersed, according to the habits of the plants and the different treatment they require, between the Palm House, No. I., the Stove (No. IX.), and the Water Lily House (No. XV.). A few are represented in the Temperate House.

BROMELIACEÆ.

The order of which the pine-apple is a familiar representative; the species are mostly epiphytal on trees and exclusively natives of the New World. According to Aiton's *Hortus Kewensis*, 16 species had been introduced at Kew previous to 1813. In 1864 Smith states (*Records* p. 206) that the number amounted to nearly 100.

In *Appendix II.* to the *Kew Report* for 1878 a list of species cultivated at that time was given, numbering 147. The extent of the collection was much increased by the purchase in 1886 of a large selection from that formed by the late Professor Edouard Morren, of Liège, which was at the time probably the richest in existence. The number of species comprised in the present list amounts to 252.

Mr. J. G. Baker, F.R.S., the present keeper of the Herbarium of the Royal Gardens, based his invaluable *Handbook of the*

Bromeliaceæ (1889) in great measure on the Kew collection of living plants, supplemented by the unique collection of drawings also formed by Professor Morren and acquired by the Bentham Trustees for the Kew Library.

For many years the collection of *Bromeliaceæ* was grown in the Palm House. The atmosphere was, however, too dry for their successful cultivation, and in 1883 they were removed to the Stove (No. IX.) and Victoria House (No. X.)

Cape Bulbs.

The orders *Hæmodoraceæ*, *Irideæ*, *Amaryllideæ*, and *Liliaceæ*, though widely dispersed, are represented in especial profusion in South Africa, and the species from that part of the world are collectively often spoken of in cultivation as "Cape Bulbs." The sixth volume of the *Flora Capensis* is entirely devoted to their description.

At the instance of the Royal Society the practice was commenced in 1772 of sending out collectors of plants to foreign countries from Kew. Francis Masson, in whose honour the genus *Massonia* was named, twice visited the Cape of Good Hope for this purpose; first, from 1774–6; and secondly, from 1786–95. He "collected and sent home a profusion of plants unknown till that time to the botanical gardens in Europe."

James Bowie (commemorated in *Bowiea*) collected at the Cape for Kew from 1817–23. He introduced amongst numerous other plants the well-known *Clivia nobilis*.

The method of growing Cape bulbs in this country originally adopted at Kew is thus described by Smith (*Records*, pp. 312, 313):—"The garden collection of bulbs were grown in glazed frames, called the bulb borders, attached to the fronts of the Botany Bay, Cape, and Palm Houses, the length of the whole being 234 feet, width 5 feet. They received heat from the flue that heated the house through openings left in the brickwork, and in severe winters they were protected by shutters. In these borders the principal of Masson's and Bowie's collections were well maintained for many years."

This system, which has been since reverted to partially, is admitted the best when the bulbs are planted out. But for the bulk of the collection it is more convenient to grow them in pots. When at rest these are kept in a private house (No. XVII. c.), from which, when in flower, they are removed to the Cape House (No. VII.).

No trustworthy statistics are available as to the number of species of tender bulbous plants cultivated at earlier periods at Kew. But the numbers enumerated in the present list are:—*Hæmodoraceæ*, 28; *Irideæ*, 221; *Amaryllideæ*, 488; *Liliaceæ*, 512; making a total of 1249.

Yuccas, Aloes, and Agaves.

Aloe (to which may be added *Haworthia*) and *Yucca* ("Adam's-needle") belong to the order Liliaceæ *Agave* to Amaryllidaceæ. In habit they have all many points of resemblance, and the majority flourish under similar cultural conditions. Hence *Agave*, though it has no near botanical affinity with *Aloe*, is often called

the "American Aloe." The bulk of the Kew collection is to be found in the Succulent House (No. V.). *Aloe* and *Haworthia* are confined to the African region, *Yucca* and *Agave* are exclusively American. Of the group of *Aloineæ* nine species are recorded by Hill as grown at Kew in 1768, and 29 by Aiton in 1814. The collection was greatly enriched by the mission of James Bowie to South Africa in 1817-23, and a large number of species were introduced which were described by Haworth ; few of these have probably been lost since that time. The collection was largely enriched in 1889 by purchases from the celebrated collection of the late John T. Peacock, Esq., of Sudbury House, Hammersmith. A selection from his extensive collection of succulents had been temporarily exhibited in the South Octagon of the Temperate House from 1878–81 (*Kew Report*, 1878, p. 6). *Appendix II.* of the *Kew Report* for 1880 gave a catalogue of the *Aloineæ*, *Yuccoideæ*' and Agaves cultivated in the Royal Gardens, including those in the Peacock collection. It enumerates 296 species.

Those catalogued in the present Hand List amount to 377.

One of the most interesting introductions of recent times is the great Natal Tree-Aloe (*Aloe Bainesii*), of which the first plant in European gardens was raised from a cutting sent to Kew in 1867 by Mrs. Barber. It is figured in the *Botanical Magazine* (t. 6848). The other African arborescent species (*A. dichotoma*), which has been lost to cultivation, was re-introduced by Sir Henry Barkly, G.C.M.G.. K.C.B., Governor, Cape of Good Hope, 1870–7.

The history of a specimen of the arboreous *Yucca filifera* of North-East Mexico is sufficiently remarkable to deserve notice. "The trunk was sent to Kew in October, 1888, by Mr. C. G. Pringle, through Professor Sargent. When it arrived at Kew it appeared to be quite dead, and was accordingly placed in Museum No. III. After remaining there two years it put out rudimentary leaves and an inflorescence, and on being transferred to the Temperate House these were fully developed in September, 1890." Unfortunately, after this effort, it finally succumbed. It is figured in the *Bot. Mag.* (t. 7197).

Palms.

Palms form an order of plants which is conspicuously distinct from all others. Their salient characters are indeed familiar at a glance. The majority are natives of the Tropics, and therefore in this country require a high temperature for their cultivation. The greater number are natives of the New World, and in the old Africa is poorest in species. A few are found in extra-tropical countries, and to these the gardens of Southern Europe owe much of their striking character and beauty. The *Kew Bulletin* for 1889 (pp. 291–297) contain an account of the species cultivated on the Riviera. In this country these require the protection of glass ; but one, *Trachycarpus excelsa*, a native of China, is hardy out of doors.

The total number of species actually known to botanists is upwards of 1100, but many doubtless still remain to be described.

In 1768 six species were enumerated in Hill's *Hortus Kewensis* as in cultivation at Kew. In 1787 Aiton in his *Hortus Kewensis*

gives 10, and in 1813, in the second edition, 20. Smith states (*Records*, p. 96) that in 1830 the collection had increased to 40 species and enumerates 141 species as cultivated in the Royal Gardens from 1760–1864 (pp. 98–106). *Appendix II.* to the *Kew Report* for 1882 (pp. 53–73) contains a classified list of the Palms cultivated in the Royal Gardens; this includes 370 species.

The number catalogued in the present Hand List amounts to 407. Of these 40 are represented in the Temperate House. This is probably the largest assemblage of species of the order to be found in any one place in the world. It is doubtful whether it does not exceed that in the Botanic Garden at Buitenzorg, in Java, which in any case excels the Kew collection in the magnitude of individual species if it does not actually do so in the number cultivated.

In 1820, according to Smith (p. 96), the palms "occupied a lean-to house called the Palm House which stood about 100 feet north of the west end of the present Fern House (No. II.): it was 60 feet long, 16 feet wide, and 15 feet high at the back." In 1828, to accommodate the increasing size of the specimens, "the house was raised four feet."

He continues:—"In 1830 the collection had increased to 40 species, which necessitated placing some of them in other houses. During the latter years of the reign of George III. and George IV., a new Palm House was contemplated, and a plot of ground set apart for its erection; but nothing was done until the accession of William IV., who took much interest in improving the Gardens. In 1834 a plan for a spacious Palm House was prepared by the celebrated architect, Sir Jeffrey Wyatville, and in October, 1834, a spot was selected and the length of the house marked out in the presence of the King."

The project was not, however, carried out, and it was not until the Royal Gardens became a public institution that it was accomplished. The present building was completed in 1848, from the designs of Decimus Burton, Esq. The length of the structure is 362 feet; its width in the centre 100 feet, and height 66 feet; the wings are 50 feet wide and 30 feet high.

The oldest palm in the house is *Sabal blackburniana*. Of these there were two specimens, one of which was taken down for want of room in 1876. Smith (*Records*, pp. 122, 123) gives the following account of them:—"On my entering Kew in the Spring of 1820, the first hot house I came to was the Palm House; on looking in I was struck with what I then considered a wonderful plant, a large-leaved Fan Palm; and I found there was another of the same kind and size at the other end of the house . . . . There is no record of their introduction in the Garden books . . . . Probably they formed a part of the great collection of plants introduced by Admiral Bligh in 1793, on his return home after having introduced the Bread Fruit tree into the West Indies." The history of the palm has, however, always been enveloped in confusion. Its native home has been shown in the *Botany of the Challenger Expedition* (Part I., pp. 70–3) to be Bermuda. A figure of the Kew plant is given on Plate V. of that work.

A few other old specimens may be mentioned. The large plant of *Jubæa spectabilis* in the Temperate House is no doubt one of

"several plants raised from seeds collected in Chili by the botanical collector, Thomas Bridges, and purchased from his agent, H. Cumming, in 1843" (Smith, *Records*, p. 111).

Trachycarpus martiana is represented in the Temperate House by two fine specimens purchased "at the sale of the collections that ornamented the Conservatory of the Royal Horticultural Society's Gardens, South Kensington, in 1889. They are supposed to have been originally obtained from the garden of the Duke of Wellington at Strathfieldsaye." One is figured in the *Bot. Mag.* (t. 7128).

Howea belmoreana.—"This palm was discovered by W. Milne, botanical collector (1852–9) for Kew on the surveying ship 'Herald,' Captain Denham. One plant was received at Kew." (Smith, *Records*, p. 115.) It is peculiar to Lord Howe's island and was long grown at Kew under the name of *Veitchia canterburyana.* The Kew plant is figured in the *Bot. Mag.* (t. 7018), where it is stated to have been sent from the Sydney Botanical Gardens.

Trachycarpus excelsa is represented by specimens in different parts of the grounds. The history of the old specimen near the principal entrance (which formerly stood in front of No. I. house may be recorded. A native of Chusan and the North of China, it is one of "six plants . . . . received in 1845 from Mr. Robert Fortune, a well-known Chinese plant collector" (Smith, *Records*, p. 116).

Palms in cultivation are slow in developing the full size of their crowns. But when once this stage is achieved the upward growth of the stem is comparatively rapid. But the time is reached when the dome of the Palm House is unable to accommodate their height, and it is then necessary to cut them down and replace them. A great clearance was made from this cause in 1876 (*Report*, p. 4). Perhaps the greatest ornament of the Palm House which was felled at this date was the stately plant of *Livistona humilis*, figured in the *Bot. Mag.* (t. 6274). According to Smith (*Records*, p. 118), it had been received in 1824 as a germinating seed sent in a case from Australia by Allan Cunningham.

Screw Pines.

The *Pandanaceæ* are an order of trees or shrubs allied botanically to Aroids, but differing widely in habit. They are all tropical or nearly so, and natives of the African islands and those of the Pacific and Indian Oceans. Including *Cyclanthaceæ*, some 115 species are known, and of these about half are in cultivation at Kew, mostly in the Palm House. According to Smith (*Records*, pp. 126–7) in 1864 the number of species grown in the Royal Gardens was 15.

The collection has been much increased by the plants raised from seeds brought from Rodriguez in 1874 by Professor Bayley Balfour when attached as naturalist to the Transit of Venus Expedition.

Two notable plants which were long perhaps the most striking features in the North Wing of the Palm House no longer exist. Their prospective removal on account of size was foreshadowed

in the *Kew Report* for 1876 (p. 4), but it was not accomplished, and in the one case not by design, till nearly twenty years later. The following particulars respecting them were given in the *Kew Bulletin* for 1895, pp. 319–321.

Pandanus odoratissimus.—There is no record of the original introduction of the striking plant which, under this name, occupied a conspicuous position at the extreme end of the north wing. Smith mentions its existence (*Records*, p. 96) in 1823. Unfortunately screw pines grow only from the extremities of their branches, and do not when cut in produce new growths by the development of adventitious buds. No ordinary horticultural building can therefore eventually accommodate them, and their removal on account of unmanageable size is only a question of time. Before its removal the great Kew Screw Pine "had about 40 branches, each bearing a huge tuft of foliage, and it measured 30 ft. in height, with a diameter of 40 ft. Its weight would be about 6 tons."

It was a female plant and first fruited in 1883, and produced its large heads of fruits about a foot long almost every subsequent season. It was removed in 1894 and was then bearing five heads. Up to 1882 it was grown in a tub, and there is a good figure of it in that stage in the supplement to the *Gardeners' Chronicle* for August 5th, 1876. In that year it was lowered into a brick pit prepared for the purpose and so gained an additional space in height of 5 ft. The base of the stem with the mass of aerial roots has been carefully preserved for future exhibition in No. III. Museum. An illustration was published in the *Gardeners' Chronicle* for January 5th, 1895. *P. odoratissimus*, Roxb., is reduced in the *Flora of British India* to *P. fascicularis*, Lam.

Pandanus reflexus.—This was a striking plant of great size which stood at the end of the north wing near the staircase. It immediately attracted attention from its dense heads of enormous stiff sword-shaped leaves. According to Smith (*Records*, p. 126) it was introduced to Kew by Wallich in 1818. *P. reflexus* is an obscure species said to be a native of Bourbon. Whether the Kew plant was correctly referred to it will perhaps never be known with certainty. It was a male plant, and the correct determination of plants of this sex presents great difficulties.

In July, 1889, a large plant of *Pandanus odoratissimus* was received from the Oxford Botanic Garden and planted in the Palm House immediately opposite the *P. reflexus*. It died in the following November, apparently from the same disease as eventually also killed the larger plant. In 1891 it was noticed that the foliage of this had a somewhat yellowish and unhealthy appearance. The great heads of leaves then began one by one to fall over, evidently from a rotting of the stem at the "neck." They were removed, but the mischief continued and eventually it became necessary to sacrifice the whole plant. The disease was almost certainly due to the attacks of a fungus, *Melanconium Pandani*, which has been very destructive to Screw Pines in European Botanic Gardens.

AROIDS.

Aroideæ are a well-marked order of plants represented in our own flora by the "Cuckoo-pint" of our hedge-rows. Some

900 species are known, of which 360 are cultivated at Kew. They vary in habit from terrestial herbs to tall climbers. A large proportion are tropical and these have since 1863 been cultivated in No. I house, the architectural conservatory removed by William IV. in 1836 from Buckingham Palace to serve the purpose of a Palm House.

Aiton, in the first edition of the *Hortus Kewensis* (1787) records 20 species; the second (1813) gives 44 as grown at Kew. Smith (*Records*, p. 92) enumerates 148 as in cultivation in 1864. In *Appendix II.* to the *Kew Report* for 1877 a catalogue is given of 250 species and varieties.

One species, without doubt the most remarkable of the order, *Amorphophallus Titanum*, is no longer in the Kew collection. A full description of it is given in the *Bot. Mag.* (tt. 7153–5).

Sir Joseph Hooker writes:—"The plant, which flowered in June, 1889, was received by Sir Joseph Hooker from Dr. O. Beccari, through the Marchese Corsi Salviati, of Sesto, near Florence, exactly 10 years previously (June 1879). It was then a small seedling which had been raised at the Botanical Gardens at Florence from seeds forwarded by Dr. Beccari soon after he discovered the plant in Sumatra in 1871." The Kew plant did not mature seeds and died after flowering. A full-sized picture of the species may be seen on the ceiling of Museum No. III.

Grasses.

The number of grasses which it is worth while to grow under glass is not large. Two of the largest Bamboos are noteworthy features in the centre of the Palm House:—*Bambusa vulgaris* and *Dendrocalamus giganteus*. The former has been in cultivation at Kew from the beginning of the century. The latter, which was one of Wallich's discoveries in the Malay Peninsula, reached it later, probably from the Royal Botanic Garden, Calcutta.

In the Victoria House there is growing in the tank a fine specimen of *Gynerium saccharoides*, the "Uva grass" of commerce. It was sent to the Royal Gardens in 1875 by Dr. Capanema from Rio de Janeiro, and occasionally flowers. It is figured in the *Bot. Mag.* (t. 7352).

DLXXII.—FIJI IVORY NUTS.

In the Fiji Court of the Colonial and Indian Exhibition, in 1886, there were exhibited by the Mango Island Company, Limited, a collection of food and other products. Among them were some hard, white seeds, with the simple label "Ivory nuts." A sample of these was obtained, at the close of the Exhibition, for the Museum of the Royal Gardens, but their botanical origin could not then be traced. Recently samples of the actual seeds were sent out to Mr. D. Yeoward, Curator of the Botanic Station at Suva, Fiji, with a request that he would endeavour to identify them.

In a letter, just received, Mr. Yeoward referred them to the "Niu Sawa" (*Veitchia Joannis*, Wendl.), a palm discovered in

Fiji by Dr. Berthold Seemann, and introduced into cultivation, in European gardens, by Mr. John Veitch. A figure is given in Nicholson's *Dictionary of Gardening*, vol. IV., 139. The seeds are described in Seemann's *Flora Vitiensis*, p. 271. "The kernel is ovoid ellipsoid, tapering into a rather blunt point, 30–35 mm. long and 2 cm. in diameter, and attached, from the base to the apex, to the endocarp by means of the raphe, from which rise a number of delicate white vascular bundles. At the base these are placed parallel to each other, but towards the point overlying each other. The albumen, surrounded by a purple-coloured skin, is hard, white, even, and encloses a straight embryo.

"This palm," says Seemann, "is found all over Viti, and there is reason to believe that it is also found in the Tongan group, where, as in Fiji, it is known by the name of 'Niu Sawa,' I am told; Sawa, signifying red in Tonganese (and having no meaning in Fijian), doubtless in allusion to the fruit, which merges from bright orange into red. The spadix, on which the minute monœcious green flowers are inserted, is much branched, and the branches form large bunches, which, when loaded with ripe fruit, are rather weighty. As many as eight of these bunches are often seen on a tree at one time in various stages of development. The fruit is about the size of a walnut. At first green, it gradually changes into bright orange, and ultimately merges into red at the base. The kernel has a slight astringent taste, and is eaten by the natives, especially by the youngsters."

It will be observed that there is no mention here of the kernels becoming hard, or ivory-like, or of their use except in the young and soft state. It seems possible, however, that in the hard and dried condition of those shown at the Colonial and Indian Exhibition, they may be used for making buttons and other small articles similar to those prepared from the common ivory nuts of South America.

CURATOR, BOTANIC STATION, FIJI, TO ROYAL GARDENS, KEW.

Suva, Fiji, 30/9/96.

SIR,

I have the honour to acknowlege the receipt of yours asking information on the ivory nut exhibited by the Mango Island Company at the Colonial and Indian Exhibition of 1886. The nut is believed here to be that of the native "Niu Sawa," a palm which grows to a great height, and is named by Seeman (*Veitchia Joannis*). But, of course, native names are not to be relied on, and he might have received the name of Niu Sawa for some other palm, although his description answers fairly well to the seeds of one I am sending you. In the meantime, I will prepare specimens of the flowers and a leaf, and if you should want them, they will be ready for you. I have cleaned two of the seeds, and send you some dozen or so for planting. You will see that those cleaned are almost identical with the one you sent, except, of course, the two cleaned are fresher, and not quite so hard.

Yours most obediently,
D. YEOWARD,
Curator.

DLXXIII.—ADDITIONS TO LIST OF KEW PUBLICATIONS, 1841—1895.

In the prefatory note to the list published on pp. 1–84 it was remarked as probable that some publications which should have been included, "have eluded research or have been overlooked." This proves to have been the case, and the following supplementary list has been prepared by B. Daydon Jackson, Esq., Sec. L.S.

1867.

The Cultivated Selaginellas. By **J. G. B**[**aker**], Gard. Chron., 782–783; 902–903; 950; 1120; 1190–91; 1241.

1868.

The genus *Funkia*. By **J. G. B**[**aker**], Gard. Chron., 1015.

(P. 26, NOTE.—In Harvey's Genera of South African Plants, ed. by J. D. Hooker, the Filices were written by J. G. Baker, pp. 458–471.)

Synopsis Filicum; or, a Synopsis of all known Ferns, including the Osmundaceæ, Schizæaceæ, Marattiaceæ, and Ophioglossaceæ, chiefly derived from the Kew Herbarium, accompanied by figures representing the essential characters of each genus. By the late **W. J. Hooker** and **J. G. Baker.** [NOTE.—Pp. 1–55 by Sir W. Hooker, the remainder by Mr. Baker.]

1869.

Refugium Botanicum; or, Figures and Descriptions from Living Specimens, of little known or New Plants of Botanical Interest. Edited by W. W. Saunders. The descriptions by . . . **J. G. Baker,** . . . the plates by W. H. Fitch, vol. i.

Epilobium obscurum, Schreb. in Orkney or Shetland. By **J. Britten,** Journ. Bot., vii., pp. 340–341.

1870.

The Known forms of *Yucca*. By **J. G. Baker,** Gard. Chron., pp. 828; 923; 1088; 1122–1123; 1183–1184; 1217.

Martius, Flora Brasiliensis, vol. i, pars. II., pp. 306–624. Cyatheaceæ et Polypodiaceæ exposuit. **J. G. Baker.**

Refugium Botanicum . . . edited by W. W. Saunders. The descriptions by **J. G. Baker,** vol. iii.

Remarks on *Asarum europæum*, Linn. By **J. Britten.** Journ. Bot., viii., pp. 84–86.

On a new locality (Herefordshire) for *Asarum europæum*, Linn. By the same, l.c., p. 161.

Viola Paillouxii, Jord., identical with the Cornfield Pansy. By the same, l.c., pp. 223–224.

[Additions to T. A. Preston's] Flora of Marlborough. By the same, l.c., pp. 324–325.

1871.

Martius, Flora Brasiliensis, vol. xiv., pars. II., pp. 173–219. Connaraceæ et Ampelideæ. **J. G. Baker.**

Refugium Botanicum . . . edited by W. W. Saunders. The descriptions by **J. G. Baker,** vol. iv.

Protandry in *Butomus umbellatus*, Linn. By **J. Britten,** Journ. Bot., ix., p. 17.

Additions to the Flora of Marlborough. By the same, l.c., p. 374.

1872.

Refugium Botanicum . . . edited by W. W. Saunders. The descriptions by **J. G. Baker,** vol. v., parts 1 & 2.

1874.

Synopsis Filicum . . . By the late **W. J. Hooker** and **J. G. Baker** ed. II.

1875.

Carnivorous Plants. By J. D. Hooker. (Rep. Brit. Assoc., 1874.) Reprinted in Journal of Eastern Asia, i., pp. 38–62.

1878.

On some of the Economic Plants of Marocco. On the Canarian Flora as compared with the Maroccan. Comparison of the Maroccan Flora with that of the mountains of Tropical Africa. App. D. E. F. [by **J. D. Hooker**] in "Journal of a Tour in Marocco, by **J. D. Hooker** & **J Ball.**"

Determination by [**D. Oliver**] of Plants collected near Akaba by Mr. JOHN MILNE on Dr. Beke's Expedition to Sinai, in Arabia, January and February, 1874. In the late Dr. Charles Beke's Discoveries in Arabia and Midian, pp. 593–594.

1880.

Refugium Botanicum . . . edited by W. W. Saunders. The descriptions by **J. G. Baker,** vol. v., part 3.

Note.—The date on the title-page is "1873."

1883.

English Botany; or, Coloured Figures of British Plants, Ed. III. . . . by J. T. Boswell (formerly J. T. Boswell Syme), [revised and figures added by **N. E. Brown,**] vol xii. Nos. 84, 85.

1884.

English Botany . . . [revised by **N. E. Brown,**] Nos. 86, 87.

1885.

English Botany . . . [revised by **N. E. Brown,**] No. 88.

1886.

English Botany. . . No. 89. Index to the whole work, by **N. E. Brown.** The complete volume is dated 1886.

1887.

List of Economic Plants of Western Africa, [by **J. M. Hillier.**] In Moloney's Sketch of the Forestry of West Africa, pp. 269–458.

1888.

Les Cypripediées, texte par A. Godefroy-Lebeuf **N. E. Brown**—1 re Livraison.

The Vegetable Resources of the West Indies, by **D. Morris**, Journal London Chamber of Commerce, April, 1888.

1891.

English Botany; or Coloured Figures of British Plants. Supplement to the Third Edition, Part 1. [Ranunculaceæ-Celastraceæ] compiled and illustrated by **N. E. Brown.**

1893.

English Botany . . . Parts 2 and 3 [Sapindaceæ-Dipsaceæ.] . . . by **N. E. Brown.**

DLXXIV.—MISCELLANEOUS NOTES.

Mr. JOHN MAHON, a member of the Staff of the Royal Gardens, has been appointed, on the recommendation of Kew, by the Secretary of State for Foreign Affairs, to the post of Forester under the British Central African Protectorate.

Long Reign Celebration.—On June 22, the day of the Official Celebration of Her Majesty the Queen's long reign, the Royal Gardens were closed to the public by order of H.M.'s First Commissioner of Works and Public Buildings, in order to give the members of the Staff and employés an opportunity of seeing the Queen's progress through London. A Royal Standard, lent by the Admiralty for the occasion, was flown from the Douglas Spruce Spar, believed to be the tallest in the Old World.

Honours for Indian Botanists.—Amongst the honours bestowed by the Queen on the occasion of the celebration of Her Majesty's long reign, two will be peculiarly acceptable to the botanical world. Both Sir Joseph Hooker and Lieut.-General Strachey were promoted to be Knights Grand Commander of the Star of India. This is one of the most restricted honours in the gift of the Crown. The association of the two names in the same Gazette was peculiarly felicitous. While the former was exploring the Eastern, the latter was occupied with the same task in the Western Himalayas. General Strachey's botanical collections made at the time have never been surpassed or superseded, and supplied indispensable material for the preparation of the *Flora of British India.*

Botanical Magazine for June.—The plants figured are: *Renanthera Storiei*, *Strobilanthes callosus*, *Veronica diosmæfolia*, var. *trisepala*, *Begonia Baumanni*, and *Lælia longipes.* The *Renanthera* is a magnificent species from the Philippine Islands. The drawing was made from a specimen communicated by Sir Trevor Lawrence. *Strobilanthes callosus*, native of Western India, was raised from seeds sent to Kew from the Saharanpur Botanical Gardens. The bracts yield a resinous substance which has an odour resembling Patchouli (see *Kew Bulletin*, 1896, p. 98). The *Veronica* is a variety of one of the numerous shrubby species from New Zealand, the specimen drawn being sent to Kew from the Royal Botanic Gardens, Edinburgh. *Begonia Baumanni* is noteworthy on account of its ornamental flowers being fragrant. It is a native of Bolivia, and flowered at Kew in September, 1896. The *Lælia* is a small-flowered species from Brazil, allied to *L. crispilabia.* The plant figured was sent to Kew by Messrs. F. Sander & Co., of St. Albans, in 1893, and flowered for the first time in July, 1896.

Tropical African Plants.—A large and interesting collection from Nyasaland, made by Mr. Alex. Whyte and others, has been presented by Sir H. H. Johnston, K.C.B., late H.M. Commissioner in British Central Africa. The country explored comprises Zomba and its vicinity, Mt. Malosa, the Nyika Range, and the country between Kondowe and Karonga. An account of this journey has been published in the numbers of the *British Central African Gazette* between October, 1896, and February, 1897. The collection, which contains some 200 new species, is especially rich in Rubiaceæ, and gives a very complete idea of the vegetation of the region traversed.

Prof. A. Engler, Director of the Botanical Gardens and Museum, Berlin, has presented collections, rich in novelties, from Usambara and various other parts of German East Africa, made by Holst, Baumann and Stuhlman. A set of the plants collected by Zenker, in the Cameroons, has been contributed by Dr. E. Gilg.

Mons. W. Barbey has sent specimens of the plants collected, chiefly in northern Abyssinia, by Dr. G. Schweinfurth, which are in course of publication in the *Bulletin de l'Herbier Boissier.*

An interesting collection, made in N'gamiland by Major F. D. and Lieut. E. J. Lugard, has been received from the collectors, and contains many undescribed species. The plants collected in Sokotra and South Arabia, by the late Mr. Theodore Bent, have also been presented to Kew.

Fruit Industries in Jamaica.—Owing to the depression in the sugar industry in the West Indies, considerable interest attaches to the development of other industries likely to prove serviceable in such islands as are fortunate enough to possess the necessary conditions. In Jamaica, for instance, with a considerable extent of land rising above the level of the sea a diversified system of cultivation is practicable, and already leading to successful results. From the Blue Book of Jamaica, it appears that the total exports for the year 1895–96 were of the value of £1,873,105. Of this amount the exports to the United Kingdom were of the value of £517,504, while those to the United States were of the value of £1,067,186. The considerable trade now carried on between Jamaica and the United States is chiefly in fruit and other fresh tropical produce conveyed by a considerable fleet of steamers specially fitted for the purpose. The principal fruit cultivated is the banana. Of this, 4,220,796 bunches were exported in 1895–96 of the value of £316,560, while oranges, owing to the recent destruction of the orange trees in Florida, were exported to the number of 97,925,398, and the value of £169,794. These two fruits were therefore shipped to the value of £456,354. During the same period the exported value of sugar (formerly the chief staple of the Colony) amounted to only £195,459, while the value of the rum was £164,600. The combined value of the exports in sugar and rum was therefore £360,059, only one-fifth of the whole produce of the Colony or about £200,000 less than the combined value of two of the fruits exported, viz., the bananas and oranges. Jamaica has, however, other valuable industries; the logwood exported in 1895–96 reached, in spite of low prices, a value of £359,039, coffee a value of £284,821, ginger a value of £50,328, pimento or allspice a value of £90,046, cigars a value of £7,649, and tobacco a value of £197. It may be mentioned that numerous other fruits and fruit products besides bananas and oranges are being gradually increased in export value from year to year. The following figures afford interesting indications of this increase: cocoa-nuts, £37,774; grape-fruit, £5,832; shaddocks, £118; Tangerine oranges, £120; limes and lime juice, £5,585; pine-apples, £524; kola-nuts, £291; whilst, tamarinds and unenumerated fruits account for £212. The total value of the fruit exported from Jamaica at the present time amounts to £537,601. The fruit exported from Jamaica as the Tangerine orange is for the most part the large fruited Mandarin orange, native of China. Both the leaves and the loose rind of this fruit possess a characteristic odour unlike that of any other of the orange tribe. The true Tangerine orange is smaller than the Mandarin, with an agreeable but slightly perfumed flavour.

ROYAL GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 128-129.] AUGUST-SEPTEMBER. [1897.

DLXXV.—DIAGNOSES AFRICANÆ, X.

The following descriptions include some of the novelties contained in several important collections recently received at Kew. That of Dr. Forsyth Major, amounting to 575 species was made in Central Madagascar, an area in which he had been preceded by the Rev. R. Baron; the proportion of new species found was consequently not so great as it would otherwise have been. Mr. G. L. Bates has sent several small collections from the Cameroons region, and although he has not penetrated far into the interior, he has succeeded in discovering a number of previously undescribed plants. Sir Harry H. Johnston, late H.M. Commissioner in British Central Africa, has transmitted to Kew the extensive and important collections made by Mr. Alexander Whyte, Head of Scientific Department, Zomba. A large portion of these were made in North Nyasaland, a country which had never previously been explored botanically.

418. **Cleome epilobioides**, *Baker* [Capparideæ]; ad *C. monophyllam*, Linn., magis accedit.

Herba erecta, gracilis, pubescens. *Folia* sessilia, lanceolata, acuta, integra, ascendentia, inferiora 1½–2 poll. longa, superiora valde reducta. *Flores* axillares, solitarii, pedicellis 3–6 lin. longis, fructiferis patulis. *Sepala* lanceolata, dense pubescentia, 2 lin. longa. *Petala* obovata, longe unguiculata, lilacina, calyce paulo longiora. *Stamina* 8–10, calyci æquilonga. *Capsula* linearis, 2–2½ poll. longa, pubescens, crebre longitudinaliter nervata, ad basin sensim angustata, valvis a placentis demum discretis. *Semina* curvata, pallide brunnea, glabra, rugis transversis ornata.

BRITISH CENTRAL AFRICA. Plains of Zomba, alt. 2500–3500 ft., *Whyte.*

419. **Pittosporum oblongifolium**, *C. H. Wright* [Pittosporeæ]; arborescens, foliis oblongis glabris chartaceis, cymis paucifloris.

Arbor parva. *Folia* integra vel obscure dentata, glabra, 7 poll. longa, 2½–3 poll. lata; petioli ½-poll. longi. *Cymæ* terminales, paucifloræ. *Sepala* 2 lin. longa, rotundata, valde imbricata, minute fimbriata. *Petala* oblonga, quam sepala sesquilongiora, viridi-lutescentia. *Filamenta* brevia; antheræ oblongæ; connectivum supra in appendicem scariosam productum. *Ovarium* globosum, placentis 3 pluriovulatis; stylus filiformis, stigmate subpeltato.

West tropical Africa. Efulen, Cameroons, *Bates*, 432.

The oblong leaves are much larger and less coriaceous, and the cymes bear fewer flowers than in any other African species.

420. **Pittosporum malosanum,** *Baker* [Pittosporeæ]; ad *P. abyssinicum*, Del., et *P. viridiflorum*, Sims, arcte accedit.

Frutex vel arbor parva. *Rami* graciles, juniores pubescentes. *Folia* breviter petiolata, oblanceolato-oblonga, acuta vel obtusa, subcoriacea, glabra, 2–8 poll. longa, ad basin sensim attenuata. *Paniculæ* densæ, terminales, corymbosæ, ramulis pubescentibus, pedicellis calyce sæpe longioribus. *Calyx* campanulatus, pubescens, 1 lin. longus, lobis ovatis obtusis, tubo brevissimo. *Petala* oblanceolata, obtusa, flavo-brunnea, 2½ lin. longa. *Stamina* petalis paulo breviora, filamentis antheris longioribus. *Fructus* ignotus.

British Central Africa. Mount Malosa, near Zomba, alt. 4000–6000 ft., *Whyte*.

421. **Hibiscus (Bombycella) Carsoni,** *Baker* [Malvaceæ]; ad *H. micranthum*, Linn., et *H. petræum*, Hiern, accedit.

Herba perennis, sesquipedalis vel bipedalis. *Caulis* erectus, gracilis, setis stellatis appressis scaber. *Folia* obscure petiolata oblanceolato-oblonga, obtusa, 3–3½ poll. longa, subcoriacea, ad basin rotundata, dimidio superiore crenata, infra medium trinervata. *Panicula* laxa, elongata, ramulis brevibus erecto-patentibus ad apicem sæpissime trifloris. *Bracteæ* epicalycis 6, lineares, appressæ, calyce duplo breviores. *Calyx* 4 lin. longus, tubo brevi, lobis lanceolatis. *Petala* cuneata, coccinea, 9–10 lin. longa, dorso pilosa. *Stylus* petalis paulo brevior. *Carpella* dense pilosa.

British Central Africa. Fort Hill, Nyasa-Tanganyika plateau, alt. 3000–4000 ft., *Whyte*; Fwambo, Lake Tanganyika, alt. 5000–6000 ft., *Carson*. Cultivated at Kew in 1896 from seeds sent by Mr. Kenneth J. Cameron.

422. **Dombeya tanganyikensis,** *Baker* [Sterculiaceæ]; ad *D. bruceanam*, A. Rich., magis accedit.

Rami lignosi, graciles, glabri, teretes. *Folia* longe petiolata, cordato-orbicularia, cuspidata, crenata, 3–4 poll. longa et lata, utrinque dense pubescentia. *Panicula* terminalis, ampla, corymbosa, ramis multifloris erecto-patentibus simpliciter umbellatis vel furcatis; bracteæ ante anthesin caducæ, pedicellis pilosis 3–4 lin. longis. *Sepala* lanceolata, acuminata, 4½–5 lin. longa, dorso pubescentia. *Petala* cuneata, rubella, persistentia, demum scariosa, sepalis æquilonga. *Stamina* basin

coalita ut cupulam ovario æquilongam efficiant; staminodia 5, clavata, petalis paulo breviora. *Ovarium* globosum, dense pilosum.

BRITISH CENTRAL AFRICA. Fort Hill, Nyasa-Tanganyika plateau, alt. 3000–4000 ft., *Whyte*.

423. **Hermannia nyasica**, *Baker* [Sterculiaceæ]; ad *H. glanduligeram*, K. Schum., et *H. arabicam*, Harv. et Sond., magis accedit.

Suffrutex ramosissimus. *Rami* graciles, lignosi, teretes, dense glanduloso-pubescentes. *Folia* minuta, sessilia, linearia, integra, dense glanduloso-pubescentia. *Flores* solitarii, axillares, pedicellis 2–5 lin. longis. *Calyx* dense glanduloso-pubescens, 2 lin. longus, tubo brevi campanulato, dentibus lanceolatis. *Petala* lanceolata, rubella, calyce vix longiora. *Antheræ* lineares, stramineæ, 2 lin. longæ, loculis apiculatis. *Stylus* 2 lin. longus. *Carpella* pubescentia, oblonga, 2 lin. longa, cuspidibus brevibus erecto-patentibus instructa.

BRITISH CENTRAL AFRICA. Monkey Bay, Lake Nyasa, alt. 1700 ft., *Whyte*.

424. **Hermannia erecta**, *N. E. Brown* [Sterculiaceæ]; *H. denudatæ*, Linn. fil., similis, sed indumento facile distinquitur.

Frutex ramosa. *Rami* erecti, stricti, brunnei, pilis minutis stellatis vestiti inter quos etiam pili magni stellati irregulariter interspersi patent. *Folia* ascendentia, breviter petiolata; petiolus 1½–2 lin. longus; lamina ¾–1¼ poll. longa, oblanceolata subabrupte acuta, basi longe cuneata, integra, apicem versus serrata, utrinque pilis fasciculatis vel stellatis pubescens; stipulæ 3–5 lin. longæ, ½–1 lin. latæ, lanceolatæ, acuminatæ. *Flores* subfasciculati; fasciculi 2–4-flori secus partem terminalem ramorum dispersi. *Bracteæ* inferiores lineari-lanceolatæ vel lineares, superiores et bracteolæ 1½–2 lin. longæ, subulatæ. *Pedunculi* et pedicelli tomentosi, hi 1–2 lin. longi, illi ¼–3 lin. longi. *Calyx* 2¼–2½ lin. longus et latus, subgloboso-campanulatus, usque ad ⅓ quinque-dentatus, stellato-tomentosus, dentibus late deltoideis acuminatis. *Petala* 3¾ lin. longa, 2 lin. lata, unguiculata; limbus subobliquus, late oblongus, apice subtruncatus, glaber; unguis convoluto-tubulosus, marginibus minute stellato-ciliatus. *Stamina* inclusa; filamenta 2⅓ lin. longa, ¾ lin. lata, oblonga, acuta, fere ad medium connata; antheræ 1 lin. longæ, oblongæ, apice minute bifidæ. *Ovarium* oblongum, pentagonum, stellato-tomentosum, stylo tereto glabro.

TRANSVAAL. Kaap Valley, Barberton, 2100 ft., April, *Galpin*, 1346.

425. **Hermannia depressa**, *N. E. Brown* [Sterculiaceæ]; *H. Woodii*, N. E. Br. propinqua, sed minus tomentosa, foliis et stipulis minoribus differt.

Rami prostrati, 6–18 poll. longi, subflexuosi, brunnei, glanduloso-pubescentes, interdum per partes pilis stellatis parce obtecti. *Folia* patentia; petiolus 1–2 lin. longus; lamina ½–1½ poll. longa

$\frac{1}{4}$–1 poll. lata, oblongo-ovata, obtusa, basi cordata vel late rotundata, marginibus plus minusve irregulariter crenato-dentata, supra glabra, subtus plus minusve glanduloso-pubescens vel rarissime in venis pilos stellatos paucos gerens. *Stipulæ* 1–1$\frac{1}{2}$ lin. longæ, $\frac{3}{4}$–1 lin. latæ, ovatæ, acutæ. *Pedunculi* $\frac{1}{2}$–1$\frac{1}{2}$ poll. longi, axillares, biflori. *Bracteæ* 1$\frac{1}{2}$-2 lin. longæ, ut cucullum bifidum conficiant connatæ. *Pedicelli* 2–11 lin. longi, inæquales. *Calyx* 2–2$\frac{1}{2}$ lin. longus, campanulatus, usque ad medium 5–lobus; lobi deltoidei, acuti; ii utrinque et pedunculus et pedicellus glanduloso-pubescentes. *Petala* 3–4 lin. longa, 1$\frac{1}{2}$–2 lin. lata, cuneato-obovata, obtusa, glabra, aurantiaca. *Stamina* inclusa; filamenta medio utrinque tuberculata, dorso hirta. *Ovarium* obovoideum, glanduloso-pubescens, stylo parce hirto. *Capsula* subglobosa; semina glabra.—*Mahernia erodioides*, var. *latifolia*, Harv. in *Harv. & Sond. Fl. Cap.* I., 214.

SOUTH AFRICA. Griqualand East: mountains around Kokstad, 4500 ft., *MacOwan*, *Herb. Aust.-Afr.*, 1412. Natal: near Umlaas River, 2000 ft., *Wood*, 1828; near Pietermaritzburg, *Sanderson*; near Port Natal, *Sutherland*; and without precise locality, *Gerrard*. Prince Albert Div.: between the great Zwarte Bergen and Kandos Berg, 2000–3000 ft., *Drège*, 7309. Albert Div.: near Braam Berg, *Cooper*, 1361. Basutoland, *Cooper*, 2007, 2010. Orange Free State: Bloemfontein, *Rehmann*, 3905; Sand River, *Burke*, 400. Transvaal: Mooi River, *Nelson*, 333; plains around Barberton, 2800 ft., *Galpin*, 1080.

426. **Geranium vagans**, *Baker* [Geraniaceæ]; ad *G. simense*, Hochst., magis accedit.

Herba perennis. *Caules* decumbentes, pubescentes, graciles. *Folia* breviter petiolata, ad basin trifida, pubescentia, 9–12 lin. lata, segmentis pinnatis, lobis linearibus uninerviis; stipulæ parvæ, lanceolatæ, scariosæ. *Pedunculi* erecti, graciles, elongati, biflori, bracteis 3 minutis lanceolatis mucronatis, pedicellis elongatis cernuis. *Sepala* lineari-oblonga, 3 lin. longa, conspicue mucronata, dorso dense pubescentia. *Petala* integra, cuneata, 2 lin. lata, calyce paulo longiora. *Stamina* calyce paulo breviora. *Rostrum* fructiferum 7–8 lin. longum; stylus carpellaque pubescentes.

BRITISH CENTRAL AFRICA. Nyika plateau, alt. 6000–7000 ft., *Whyte*.

427. **Pelargonium Whytei**, *Baker* [Geraniaceæ]; ad *P. alchemilloides*, Willd., et *P. multibracteatum*, Hochst., accedit.

Herba perennis, pedalis vel sesquipedalis. *Caules* ascendentes, graciles, parce pilosi. *Folia* breviter petiolata, parce pilosa, trifida, segmentis obovato-cuneatis 1–1$\frac{1}{2}$ poll. longis profunde crenatis; stipulæ parvæ, ovatæ, acutæ, scariosæ. *Pedunculi* elongati, ascendentes, 2–4-flori, bracteis 4–5 lanceolatis cuspidatis pubescentibus; pedicelli 4–6 lin. longi. *Sepala* lanceolata, cuspidata, pubescentia, 4$\frac{1}{2}$ lin. longa. *Petala* oblanceolata, rubra, calyce paulo longiora. *Rostrum* fructiferum dense pilosum; lobi stigmatici 5, subulati, glabri.

BRITISH CENTRAL AFRICA. Nyika plateau, alt. 7000 ft., *Whyte*, 244.

428. **Impatiens zombensis**, *Baker* [Geraniaceæ-Balsamineæ]; ad *I. capensem*, Thunb., arcte accedit.

Caules graciles, erecti, sursum parce pilosi. *Folia* breviter petiolata, oblonga, acuta, membranacea, 2–3 poll. longa, argute serrata, facie glabra, dorso pubescentia, basi petioloque setis paucis glanduliferis prædita. *Pedunculi* axillares, elongati, erecti, simplices vel furcati. *Petala* parva, violacea; calcar curvatum, 1 poll. longum, tenue, e basi subulatum. *Ovarium* cylindricum, glabrum.

BRITISH CENTRAL AFRICA. Plateau of Mount Zomba, alt. 5000–6000 ft., *Whyte*.

429. **Ochna longipes**, *Baker* [Ochnaceæ]; ad *O. macrocalycem*, Oliv., accedit.

Arbor glabra, ramulis gracilibus. *Folia* alterna, sessilia, oblongo-lanceolata, acuta vel acuminata, 2½–3 poll. longa, 9–12 lin. lata, dentata, basi cuneata, modice firma, utrinque glabra, saturate viridia. *Racemi* brevissimi, axillares, pauciflori, pedunculo brevissimo, pedicellis gracillimis glabris 6–9 lin. longis. *Sepala* post anthesin viridia, lineari-oblonga, chartacea, 5–6 lin. longa. *Stamina* calyce duplo breviora. *Carpella* 5, globosa, glabra; stylus 2 lin. longus, apice stigmatosus, integer, capitatus.

BRITISH CENTRAL AFRICA. Mount Malosa, near Zomba, alt. 4000–6000 ft., *Whyte*.

430. **Ochna shirensis**, *Baker* [Ochnaceæ]; ad *O. macrocalycem*, Oliv., etiam accedit.

Arbor glabra, ramulis lignosis virgatis. *Folia* brevissime petiolata, oblongo-lanceolata, acuta, 2–3 poll. longa, basi cuneata, denticulata, firmula, utrinque viridia glabra. *Racemi* axillares, simplices vel basi furcati, breviter pedunculati, pauciflori vel multiflori, pedicellis gracilibus 6–9 lin. longis. *Sepala* post anthesin lineari-oblonga, pallide brunnea, 4–4½ lin. longa. *Stamina* sepalis duplo breviora, antheris parvis oblongis per longitudinem totam dehiscentibus. *Carpella* 5, globosa; stylus integer, apice stigmatosus, capitatus.

BRITISH CENTRAL AFRICA. Mount Zomba and Mount Malosa, alt. 4000–6000 ft., *Whyte*.

431. **Gymnosporia ferruginea**, *Baker* [Celastrineæ]; pedunculis solitariis haud furcatis.

Frutex inermis. *Rami* virgati, lignosi, pubescentes. *Folia* alterna, breviter petiolata, oblonga, 2–3 poll. longa, obtusa, integra, rigide coriacea, facie obscure, dorso conspicue ferrugineo-pubescentia. *Racemi* densi, pauciflori, axillares; pedunculi breves, foliis multo breviores, pedicellis brevibus pubescentibus; bracteæ lanceolatæ, pilosæ. *Calyx* parvus, campanulatus, dense pilosus, dentibus 5 deltoideis. *Petala* 5, oblonga, obtusa, ¾ lin. longa. *Stamina* petalis breviora. *Fructus* ignotus.

BRITISH CENTRAL AFRICA. Mount Zomba, alt. 4000–6000 ft., *Whyte*.

432. **Lasiodiscus marmoratus,** *C. H. Wright* [Rhamnaceæ]; arborescens, ramis junioribus dense ferrugineo-tomentosis, foliis basi rotundatis.

Arbor parva. *Rami* petioli pedunculique pilis ferrugineis vestiti. *Folia* ovato-oblonga, acuminata, basi rotundata, breviter petiolata, obscure serrata, chartacea, supra glabra, subtus ad nervos minute pubescentia, 9 poll. longa, 5½ poll. lata, nervis siccitate albis. *Paniculæ* axillares, 6 poll. longæ, multifloræ. *Flores* 3 lin. diam. *Calycis* lobi triangulares, valvati, extus tomentosi, per anthesin reflexi. *Petala* alba, cucullata, quam sepala multo minora. *Stamina* 5, petalis velata. *Discus* magnus, annularis, ovarium obtegens. *Ovarium* triloculare, ovulis in quoque loculo solitariis; stylus trilobatus.

West tropical Africa. Efulen, Cameroons, *Bates*, 358.

This can be at once distinguished from *L. Mannii*, Hook. fil., by the dense rusty tomentum on the younger branches and petioles and by the rotundate bases of the leaves. The veins on the upper side of the leaf are conspicuous by their whiteness, at least when dry.

433. **Vitis (Cissus) variifolia,** *Baker* [Ampelideæ]; ad *V. congestam*, Baker, accedit.

Caules validi, flexuosi, pubescentes, cirrhis haud obviis, internodiis superioribus 2–3 poll. longis. *Folia* sessilia, 1–3-foliolata; foliola oblanceolato-oblonga, subacuta, supra basin crenata, 6–9 poll. longa, supra medium 2–2½ poll. lata, subcoriacea, facie scabra, dorso pubescentia, e medio ad basin sensim angustata; stipulæ magnæ, foliaceæ, persistentes, ovato-acuminatæ. *Panicula* terminalis, sessilis vel pedunculata, 2 poll. diam., ramis pubescentibus, pedicellis brevibus. *Calyx* campanulatus, minutus, pubescens, dentibus 4 parvis latis. *Corolla* 1 lin. longa, viridis, medio constricta, petalis 4 diu conniventibus. *Ovarium* globosum, glabrum.

British Central Africa. Plain of Zomba, alt. 2500–3000 ft., *Whyte.*

434. **Vitis (Cissus) apodophylla,** *Baker* [Ampelideæ]; ad *V. congestam*, Baker, magis accedit.

Caules validi, flexuosi, pubescentes, cirrhis haud obviis, internodis superioribus 3–4 poll. longis. *Folia* sessilia vel subsessilia, 2–3-foliolata; foliola oblanceolato-oblonga, acuta, 6–9 poll. longa, supra medium 2–2½ poll. lata, e medio ad basin sensim angustata, supra basin serrata, membranacea, facie sordide viridia glabra, dorso pubescentia. *Panicula* terminalis, longe pedunculata, ramis sursum valde compositis pubescentibus; pedicelli breves. *Calyx* pubescens, campanulatus, minutus, dentibus 4 parvis latis. *Corolla* viridis, 1 lin. longa, medio constricta, petalis 4 diu conniventibus. *Ovarium* globosum, glabrum.

British Central Africa. Mount Zomba, alt. 2500–3500 ft., *Whyte.*

435. **Vitis (Cissus) masukuensis,** *Baker* [Ampelideæ]; ad *C. Buchanani*, Planch., magis accedit.

Caules sarmentosi, graciles, haud lignosi, apice leviter pubescentes. *Folia* longe petiolata, 5–foliolata; foliola membranacea, supra basin profunde crenata, subacuta, utrinque viridia glabra, foliolo terminali oblanceolato-oblongo petiolulato 3–4 poll. longo; stipulæ ovatæ, persistentes. *Panicula* laxissima, 5–6 poll. diam., ramis primariis patulis recurvatis laxe paniculatis dense pubescentibus, pedicellis cernuis floribus valde longioribus. *Calyx* minutus, campanulatus, pubescens, dentibus 4 parvis latis. *Corolla* 1 lin. longa, petalis 4 diu conniventibus. *Ovarium* ovoideum, glanduloso-pilosum.

British Central Africa. Masuku plateau, near Karonga, alt. 6500-7000 ft., *Whyte.*

436. **Deinbollia nyikensis,** *Baker* [Sapindaceæ]; ad *D. pinnatam*, Schum. et Thonn., magis accedit.

Arbor erecta. *Rami* lignosi, apice brunneo-pubescentes. *Folia* 4–6 poll. longa (petiolo 1–2 poll. longo incluso), foliolis 3–4 jugis subsessilibus oblongis pallide viridibus subcoriaceis obtusis integris 4–6 poll. longis glabris vel dorso obscure pubescentibus. *Paniculæ* terminales 8–9 poll. longæ, ramulis dense brunneo-velutinæ, axillares breviores vel nullæ; pedicelli crassi, brevissimi. *Sepala* ovata, dense velutina, 1½ lin. longa. *Petala* obtusa, pilosa, calyce paulo longiora. *Stamina* 8, petalis subæquilonga, filamentis pilosa, antheris linearibus parvis. *Ovarium* in floribus submasculis rudimentarium. *Fructus* ignotus.

British Central Africa. Nyika plateau, alt. 6000–7000 ft. and between Kondowe and Karonga, North Nyasa-land, *Whyte.*

437. **Crotalaria argyrolobioides,** *Baker* [Leguminosæ-Genisteæ]; ad *C. atrorubentem*, Hochst., magis accedit.

Herba perennis, ramosissima. *Ramuli* ascendentes, teretes, dense pubescentes. *Folia* breviter petiolata, digitatim trifoliolata, foliolis oblanceolatis obtusis vel leviter emarginatis minute mucronatis 3–6 lin. longis facie viridibus glabris dorso pallidis pubescentibus; stipulæ minutæ, caducæ. *Racemi* breves, terminales, sæpissime densi, pedicellis 1½–2 lin. longis dense pubescentibus; bracteæ foliaceæ vel minutæ. *Calyx* 2 lin. longus, dense pubescens, dentibus lanceolatis vel deltoideis tubo campanulato æquilongis. *Corolla* calyce duplo longior, lutea, striis et maculis rubro-brunneis decorata, vexillo dorso pubescente, carina curvata conspicue rostrata. *Legumen* sessile, oblongum, turgidum, pilosum, 3 lin. longum, seminibus 5–6 brunneis.

British Central Africa. Nyika plateau, alt. 6000–7000 ft., *Whyte*, 109, 117.

438. **Crotalaria sparsifolia,** *Baker* [Leguminosæ-Genisteæ]; ad *C. sphærocarpam*, Perott., magis accedit.

Herba perennis, erecta, ramosissima. *Ramuli* graciles, ascendentes, pilis ascendentibus albidis vestiti. *Folia* pauca, sparsa, brevissime petiolata, digitatim trifoliolata, foliolis oblanceolatis

acutis mucronatis 2–3 lin. longis, facie viridibus glabris, dorso dense pilosis; stipulæ nullæ vel cito deciduæ. *Racemi* laxissimi, pauciflori, terminales, pedicellis brevibus strigosis; bracteæ lineares, minutæ. *Calyx* pilosus, $1\frac{1}{2}$ lin. longus, tubo brevi, dentibus lanceolatis. *Corolla* calyce duplo longior, vexillo rubro-luteo dorso pubescente, carina curvata conspicue rostrata. *Legumen* sessile, pilosum, subglobosum, 2–3-spermum, 2 lin. longum.

British Central Africa. Nyika plateau, alt. 6000–7000 ft., and between Kondowe and Karonga, *Whyte*.

439. **Crotalaria phyllostachys**, *Baker* [Leguminosæ-Genisteæ]; ad *C. sphærocarpam*, Perott., magis accedit.

Suffrutex erectus, ramosissimus. *Rami* lignosi, graciles, ascendentes, teretes, virgati, pilis ascendentibus dense vestiti. *Folia* breviter petiolata, digitatim trifoliolata, foliolis oblanceolatis obtusis mucronatis 6–9 lin. longis pallide viridibus facie glabrescentibus dorso pilosis; stipulæ nullæ vel cito deciduæ. *Flores* ad axillas foliorum omnium 1–3-ni., pedicellis dense pubescentibus 2 lin. longis. *Calyx* pilosus, 2 lin. longus, tubo brevi, dentibus lanceolato-deltoideis tubo valde longioribus. *Corolla* calyce duplo longior, vexillo leviter sericeo luteo striis brunneis decorato, carina curvata conspicue rostrata. *Legumen* sessile, oblongum, pilosum, monospermum, 2 lin. longum.

British Central Africa. Nyika plateau, alt. 6000–7000 ft. and between Mpata and the commencement of the Nyasa-Tanganyika plateau, alt. 2000–3000 ft., *Whyte*.

440. **Crotalaria Johnstoni**, *Baker* [Leguminosæ-Genisteæ]; ad *C. hyssopifoliam*, Klotzsch, magis accedit.

Herba perennis, erecta, ramosissima. *Rami* graciles, ascendentes, teretes, albido-pilosi. *Folia* breviter petiolata, digitatim trifoliolata, foliolis oblongo-oblanceolatis obtusis minute mucronatis 6–9 lin. longis facie subglabris dorso parce pilosis; stipulæ nullæ. *Flores* in racemos terminales subdensos 1–2 poll. longos aggregati aut in axillis foliorum solitarii, pedicellis brevibus pilosis; bracteæ lineares, pilosi. *Calyx* pilosus $1\frac{1}{2}$ lin. longus, tubo brevissimo, dentibus lanceolatis. *Corolla* pallide lutea, calyce duplo longior, vexillo dorso pubescente, carina conspicue rostrata. *Legumen* sessile, subglobosum, pilosum, monospermum, 2 lin. longum.

British Central Africa. Near Fort Hill, Nyasa-Tanganyika plateau, alt. 3500–4000 ft., *Whyte*.

441. **Crotalaria nyikensis**, *Baker* [Leguminosæ-Genisteæ]; ad *C. hyssopifoliam*, Klotzsch, magis accedit.

Herba perennis, erecta, ramosissima. *Ramuli* graciles, teretes, ascendentes, dense pubescentes. *Folia* breviter petiolata, digitatim trifoliolata, foliolis oblanceolatis obtusis minute mucronatis 3–6 lin. longis utrinque pallide viridibus dense pubescentibus; stipulæ nullæ. *Racemi* densi, multi, omnes terminales, globosi vel oblongi, pedicellis brevibus dense pilosis; bracteæ parvæ, lineares, pilosæ. *Calyx* dense pilosus, 1 lin. longus, dentibus

deltoideis acuminatis tubo valde longioribus. *Corolla* pallide rubella, calyce duplo longior, dense pubescens, carina valde rostrata. *Legumen* sessile, subglobosum 1–2-spermum, 2 lin. longum, dense pilosum.

BRITISH CENTRAL AFRICA. Nyika plateau, alt. 6000–7000 ft., *Whyte.*

442. **Crotalaria leucotricha,** *Baker* [Leguminosæ-Genisteæ]; ad *C. hyssopifoliam*, Klotzsch, magis accedit.

Herba perennis, erecta, e basi ramosissima. *Caules* graciles, erecti, semipedales, vel pedales, ubique dense albido-pilosi. *Folia* breviter petiolata, digitatim trifoliolata, foliolis oblanceolatis 3–4 lin. longis obtusis conspicue mucronatis utrinque dense persistenter pilosis; stipulæ nullæ vel cito deciduæ. *Racemi* laxi, multiflori, terminales, pedicellis brevibus dense pilosis; bracteæ lineares. *Calyx* dense pilosus, 2 lin. longus, tubo brevi, dentibus lanceolatis vel ovato-lanceolatis acuminatis tubo valde longioribus. *Corolla* pallide lutea, 3 lin longa, vexillo dorso dense piloso, carina curvata conspicue rostrata. *Legumen* sessile, pilosum, subglobosum vel oblongum, monospermum, 1½–2 lin. longum.

BRITISH CENTRAL AFRICA. Near Fort Hill, Nyasa-Tanganyika plateau, alt. 3500–4000 ft., *Whyte.*

443. **Crotalaria pauciflora,** *Baker* [Leguminosæ-Genisteæ]; ad *C. ivantulensem*, Welw., angolensem magis accedit.

Suffrutex ramosissimus. *Ramuli* graciles, lignosi, ascendentes, pubescentes. *Folia* breviter petiolata, digitatim trifoliolata, foliolis obovatis obtusis mucronatis 2–3 lin. longis facie subglabris dorso dense pubescentibus; stipulæ minutæ, caducæ; *Flores* 1–3-ni, terminales, pedicellis brevibus cernuis pubescentibus. *Calyx* pilosus, 3 lin. longus, dentibus lanceolatis tubo campanulato æquilongis. *Corolla* calyce duplo longior. *Legumen* oblongum, 4 lin. longum, pubescens, oligospermum, breviter stipitatum.

BRITISH CENTRAL AFRICA. Nyika plateau, alt. 6000–7000 ft., common, *Whyte.*

444. **Crotalaria pilosiflora,** *Baker* [Leguminosæ-Genisteæ]; ad *C. orthocladam*, Welw., magis accedit.

Frutex ramosissimus. *Rami* ascendentes, pallide virides, pubescentes. *Folia* distincte petiolata, digitatim trifoliolata, foliolis oblongis acutis mucronatis 6–15 lin longis facie subglabris dorso pubescentibus; stipulæ minutæ, lineares. *Racemi* multiflori, laxi, terminales, pedicellis dense pubescentibus; bracteæ lineari-subulatæ. *Calyx* dense pilosus 4 lin. longus, dentibus lanceolatis tubo campanulato longioribus. *Corolla* lutea, calyce paulo longior, vexillo dorso pubescente, carinæ rostro obtuso alis longiori. *Legumen* immaturum oblongum, sessile, dense pilosum, oligospermum.

BRITISH CENTRAL AFRICA. Nyika plateau, alt. 6000–7000 ft., *Whyte.*

445. **Crotalaria cæspitosa,** *Baker* [Leguminosæ-Genisteæ]; ad *C. maxillarem*, Klotzsch, magis accedit.

Herba perennis, e basi lignosa ramosissima. *Caules* dense cæspitosi, breves, graciles, diffusi, pubescentes. *Folia* breviter petiolata, digitatim trifoliolata, foliolis oblanceolatis obtusis 6–12 lin. longis utrinque viridibus primum dorso pubescentibus demum glabrescentibus; stipulæ parvæ, lineares. *Racemi* laxi, pauciflori, terminales, pedicellis pubescentibus calyce brevioribus; bracteæ lineares, minutæ. *Calyx* pubescens, 2 lin. longus, dentibus lanceolatis tubo longioribus. *Corolla* aurantiaca, calyce duplo longior, vexillo dorso glabro, carina curvata conspicue rostrata. *Legumen* sessile, oblongum, durum, glabrum, oligospermum, 5 lin. longum.

British Central Africa. Mounts Zomba and Malosa, alt. 4000–6000 ft., *Whyte.*

446. **Crotalaria oocarpa,** *Baker* [Leguminosæ-Genisteæ]; ad *C. maxillarem*, Klotzsch, magis accedit.

Suffrutex ramosissimus. *Ramuli* ascendentes, pallide virides, dense pubescentes. *Folia* petiolata, digitatim trifoliolata, foliolis oblongis acutis 6–9 lin. longis infra pubescentibus supra minute scabridis; stipulæ minutæ, deciduæ. *Racemi* terminales, pauciflori vel multiflori, subdensi, pedicellis dense pubescentibus; bracteæ lineari-subulatæ. *Calyx* dense pilosus, 4 lin. longus, tubo brevi, dentibus lanceolatis tubo valde longioribus. *Corolla* lutea, calyce paulo longior, vexillo dorso pubescente, carina conspicue rostrata. *Legumen* oblongum, sessile, 5–6 lin. longum, polyspermum, dense pubescens.

British Central Africa. Between Mpata and the commencement of the Nyasa-Tanganyika plateau, alt. 2000–3000 ft., *Whyte.*

447. **Crotalaria karongensis,** *Baker* [Leguminosæ-Genisteæ]; ad *C. maxillarem*, Klotzsch, magis accedit.

Herba perennis. *Caules* ascendentes, pallide virides, pubescentes. *Folia* longe petiolata, digitatim trifoliolata, foliolis obovatis subacutis tenuibus 1–2′ poll. longis utrinque viridibus facie glabris dorso leviter pubescentibus. *Racemi* laxissimi, terminales et axillares, 4–6 poll. longi, pedicellis, cernuis pubescentibus; bracteæ minutæ, deciduæ. *Calyx* pubescens, 2–2½ lin. longus, tubo campanulato, dentibus ovatis vel oblongis tubo æquilongis. *Corolla* pallide lutea, calyce duplo longior, vexillo dorso pubescente, carina curvata conspicue rostrata. *Legumen* oblongum, pubescens, sessile, polyspermum, 6–8 lin. longum.

British Central Africa. Between Kondowe and Karonga, *Whyte.*

448. **Crotalaria gymnocalyx,** *Baker* [Leguminosæ-Genisteæ]; ad *C. maxillarem*, Klotzsch, magis accedit.

Frutex, ramulis lignosis virgatis ascendentibus gracilis. *Folia* digitatim trifoliolata, foliolis oblanceolatis obtusis 6–9 lin. longis utrinque viridibus obscure pubescentibus, petiolo 3–4 lin. longo; stipulæ deciduæ, minutæ. *Racemi* pauciflori, laxi,

terminales, pedicellis cernuis pubescentibus calyce brevioribus; bracteæ minutæ, deciduæ. *Calyx* 3 lin. longus, tubo campanulato glabro, dentibus lanceolatis vel deltoideis acuminatis tubo æquilongis. *Corolla* lutea, 6 lin. longa, vexillo dorso glabro. *Ovarium* stipitatum, lineare, glabrum, multiovulatum. *Legumen* ignotum.

BRITISH CENTRAL AFRICA. Fort Hill, Nyasa-Tanganyika plateau, alt. 3500–4000 ft., and between Mpata and the commencement of the plateau, alt. 2000–3000 ft., *Whyte.*

449. **Crotalaria valida,** *Baker* [Leguminosæ - Genisteæ]; ad *C. rectam*, Steud., magis accedit; recedit legumine oblongo.

Frutex erectus. *Rami* lignosi, dense pubescentes. *Folia* breviter petiolata, digitatim trifoliolata, foliolis oblongis acutis basi cuneatis 12–18 lin. longis subcoriaceis facie sparse dorso dense pubescentibus; stipulæ minutæ, deciduæ. *Racemi* terminales, pauciflori, pedicellis 3–4 lin. longis; bracteæ parvæ, lineares, subcoriaceæ. *Calyx* pilosus, 6 lin. longus, tubo brevi, dentibus lanceolatis tubo valde longioribus. *Corolla* 9 lin. longa, vexillo luteo-brunneo dorso piloso, carina rostro crasso curvata. *Legumen* sessile, durum, oblongum, oligospermum, dense pilosum, 9 lin. longum.

BRITISH CENTRAL AFRICA. Nyika plateau, alt. 6000–7000 ft. *Whyte*, and between Kondowe and Karonga, *Whyte*, 373.

450. **Argyrolobium? deflexiflorum,** *Baker* [Leguminosæ-Genisteæ]; a speciebus reliquis adhuc ex Africa tropica missis recedit calyce haud bilabiato.

Herba perennis, e basi ramosissima. *Caules* graciles, glabri, diffusi, intricati. *Folia* breviter petiolata, digitatim trifoliolata, foliolis oblanceolatis obtusis mucronatis utrinque viridibus glabris, centrale 9–12 lin. longum, lateralibus minoribus; stipulæ lineares, foliaceæ, persistentes. *Racemi* densi, globosi, omnes axillares, pedunculati, pedicellis brevissimis centralibus et inferioribus deflexis; bracteæ subulatæ, minutæ. *Calyx* glaber, 2 lin. longus, dentibus deltoideis tubo campanulato brevioribus. *Corolla* albo-lilacina, calyce duplo longior, vexillo dorso glabro petalis reliquis breviore, carina obtusa. *Legumen* sessile, lineare, planum, glabrum, oligospermum, 8–9 lin. longum.

BRITISH CENTRAL AFRICA. Fort Hill, Nyasa-Tanganyika plateau, alt. 3500–4000 ft., *Whyte.*

This has the flattened pod and obtuse keel of *Argyrolobium* and the calyx of *Crotalaria.*

451. **Argyrolobium leucophyllum,** *Baker* [Leguminosæ-Genisteæ]; ad *A. shirensem*, Taubert, magis accedit.

Suffrutex caulibus gracilibus teretibus erectus, dense persistenter albo-pubescens. *Folia* breviter petiolata, digitatim trifoliolata, foliolis oblongis obtusis integris basi cuneatis 1–2 poll. longis facie viridibus obscure pilosis dorso dense persistenter albo-pubescentibus; stipulæ ovatæ, acutæ, pubescentes. *Racemi* axillares, longe pedunculati, globosi, multiflori, pedicellis brevibus sericeis; bracteæ foliaceæ, lanceolatæ. *Calyx* 4 lin. longus, dense

pubescens, profunde bilabiatus, dentibus angustis acuminatis *Corolla* pallide lutea, calyce vix longior, vexillo obovato dorso dense piloso. *Ovarium* multiovulatum, lineare, dense pilosum.

BRITISH CENTRAL AFRICA. Nyika plateau, alt. 6000–7000 ft., *Whyte*, 251.

452. **Argyrolobium longipes**, *N. E. Brown* [Leguminosæ-Genisteæ]; *A. pumilo* Eck. et Zeyh., affine, sed foliis utrinque hirtis et pedunculis multo longioribus differt.

Caules prostrati, ramosi, ramis 3–10 poll. longis, lignescentes, appresse pubescentes. *Folia* petiolata, trifoliolata; petioli $\frac{3}{4}$–$2\frac{1}{2}$ lin. longi; foliola 3–7 lin. longa, 2–$4\frac{1}{2}$ lin. lata, elliptica, obtusa, mucronulato-apiculata, utrinque appresse pilosa; stipulæ 1–2 lin. longæ, $\frac{1}{3}$–1 lin. latæ, lanceolatæ ovato-lanceolatæ vel ovatæ, acuminatæ vel acutæ, supra glabræ, subtus pilosæ. *Pedunculi* foliis oppositi, $\frac{3}{4}$–3 poll. longi, uniflori, appresse pubescentes. *Bracteolæ* $\frac{1}{2}$–1 lin. longæ, subulatæ vel lanceolatæ. *Pedicelli* breves. *Calyx* $2\frac{1}{2}$–4 lin. longus, profunde bilabiatus, appresse pilosulus, labio superiore bidentato, inferiore tridentato, dentibus lanceolatis acuminatis æquilongis. *Corolla* 4–5 lin. longa; vexillo suborbiculari unguiculato dorso sericeo-pubescente; alis oblongis obtusis apice pubescentibus, carina subacuta glabra. *Ovarium* pluriovulatum, appresse fulvo-pubescens.

SOUTH AFRICA. Transvaal: Berea Ridge, Barberton, 3,000 ft., February, *Galpin*, 1305. Natal, without precise locality, *Gerrard*, 1764, 1765.

453. **Indigofera lupulina**, *Baker* [Leguminosæ-Galegeæ]; ad *I. strobiliferam*, Hochst., e sectione Capitatarum magis accedit.

Herba annua, humilis, e basi ramosa, ubique albo-lanosa. *Folia* breviter petiolata, pinnatim trifoliolata, foliolis oblongis obtusis 5–6 lin. longis basi cuneatis facie breviter dorso longe albo-lanosis; stipulæ magnæ, ovatæ, acutæ, membranaceæ, persistentes. *Racemi* axillares et terminales, oblongi, pedunculati, 9–12 lin. longi; bracteæ unifloræ, orbiculares, emarginatæ, 3 lin. longæ et latæ, persistentes, imbricatæ. *Calyx* 1 lin. longus, tubo brevissimo, dentibus setaceis. *Corolla* calyce 2–3-plo longior. *Legumen* oblongum, dispermum, 2 lin. longum.

BRITISH CENTRAL AFRICA. Between Kondowe and Karonga, *Whyte*, 336.

454. **Indigofera nyikensis**, *Baker* [Leguminosæ-Galegeæ]; ad *I. griseam*, Baker, e sectione Dissitiflorarum magis accedit.

Suffrutex gracilis. *Ramuli* lignosi, pilis appressis albis et deorsum setis patulis brunneis vestiti. *Folia* breviter petiolata, imparipinnata, foliolis 5–7 oblanceolatis conspicue mucronatis 3–4 lin. longis rigidulis utrinque dense albo-pilosis; stipulæ minutæ, lineari-subulatæ, scariosæ. *Flores* ad apices ramulorum pauci, pedicellis dense pilosis. *Calyx* 2 lin. longus, dense pilosus, tubo brevi campanulato, dentibus lineari-setaceis glanduloso-pilosis tubo multo longioribus. *Corolla* rubra, calyce duplo longior. *Ovarium* cylindricum, sessile, multiovulatum. *Legumen* ignotum.

BRITISH CENTRAL AFRICA. Nyika plateau, alt. 6000–7000 ft., *Whyte*, 151.

455. **Indigofera microscypha**, *Baker* [Leguminosæ-Galegeæ] ; ad *I. nyikensem*, Baker, (vide supra) e sectione Dissitiflorarum arcte accedit, sed differt setis patulis nullis petalisque minoribus.

Suffrutex gracilis. *Ramuli* juniores ascendentes, appresse albo-pilosi. *Folia* breviter petiolata, imparipinnata, foliolis 7 oblanceolatis mucronatis rigidulis 3–4 lin. longis, utrinque pallide viridibus appresse albo-pilosis ; stipulæ minutæ, caducæ. *Flores* ad apices ramulorum pauci, breviter racemosi, pedicellis dense albo-pilosis. *Calyx* albo-pilosus, 2 lin. longus, tubo brevissimo, dentibus elongatis lineari-setaceis glanduloso-pilosis. *Corolla* rubra, 3 lin. longa, extus pilosa. *Ovarium* sessile, cylindricum, multiovulatum. *Legumen* ignotum.

BRITISH CENTRAL AFRICA. Between Mpata and the commencement of the Nyasa-Tanganyika plateau, alt. 2000–3000 ft., *Whyte*.

456. **Indigofera patula**, *Baker* [Leguminosæ-Galegeæ] ; ad *I. pentaphyllam*, Linn., e sectione Dissitiflorarum accedit.

Herba perennis, e basi ramosissima. *Caules* breves, patuli, graciles, glanduloso-setosi et appresse albo-pilosi. *Folia* breviter petiolata, imparipinnata, foliolis 7 oblanceolatis mucronatis 3 lin. longis, utrinque viridibus dense albo-pilosis ; stipulæ setaceæ. *Racemi* multi, axillares, laxi, pauciflori, pedunculati, pedicellis cernuis. *Calyx* dense pilosus, 2 lin. longus, tubo brevissimo, dentibus elongatis setaceis glandulosis. *Corolla* rubra, calyce duplo longior. *Ovarium* sessile, cylindricum, multiovulatum.

BRITISH CENTRAL AFRICA. Nyika plateau, alt. 6000–7000 ft., *Whyte*.

457. **Indigofera macra**, *Baker* [Leguminosæ-Galegeæ] ; ad *I. pentaphyllam*, Linn. e sectione Dissitiflorarum magis accedit.

Herba erecta, ramosissima. *Ramuli* gracillimi, ascendentes, juniores appresse albo-pilosi. *Folia* breviter petiolata, imparipinnata, foliolis oblanceolatis mucronatis 2–3 lin. longis utrinque glaucis appresse albo-pilosis ; stipulæ setaceæ, caducæ. *Racemi* laxi, pauciflori, axillares, breviter pedunculati, pedicellis brevissimis. *Calyx* 1 lin. longus, dense albo-pilosus, tubo brevissimo, dentibus setaceis. *Corolla* rubra, calyce duplo longior. *Legumen* sessile, cylindricum, polyspermum, dense pilosum, 3 lin. longum.

BRITISH CENTRAL AFRICA. Between the Songwe river and Karonga, alt. 1700–2000 ft., *Whyte*.

458. **Indigofera (Sphæridiophorum) karongensis**, *Baker* [Leguminosæ-Galegeæ] ; ad *I. terminalem*, Baker, magis accedit.,

Frutex ramosissimus. *Ramuli* lignosi, argenteo-incani. *Folia* sessilia, foliolis 5 oblanceolatis obtusis mucronatis rigidis 2 lin. longis, utrinque dense persistenter albo-pilosis ; stipulæ setaceæ. *Racemi* axillares, pauciflori, foliis æquilongi, pedicellis brevibus

incanis. *Calyx* ¾ lin. longus, dense albo-pilosus, dentibus deltoideis tubo æquilongis. *Corolla* calyce triplo longior. *Legumen* subglobosum, 1 lin. diam., dense albo-pilosum, durum, monospermum.

BRITISH CENTRAL AFRICA. Between Kondowe and Karonga, *Whyte*.

459. **Indigofera (Sphæridiophorum) microcalyx**, *Baker* [Leguminosæ-Galegeæ]; ad *I. demissam*, Taubert, magis accedit.

Suffrutex erectus. *Ramuli* virgati, ramosi, ubique persistenter albo-incani. *Folia* breviter petiolata, pinnatim 3–5-foliata, foliolis oblanceolatis mucronatis rigidulis utrinque dense albo-pubescentibus; stipulæ minutæ, subulatæ. *Racemi* numerosi, densi, pauciflori, brevissime pedunculati, pedicellis brevissimis pilosis. *Calyx* ½ lin. longus, pilosus, dentibus acuminatis tubo æquilongis. *Corolla* calyce quadruplo longior. *Legumen* sessile, subglobosum, monospermum, pilosum, 1 lin. longum.

BRITISH CENTRAL AFRICA. North Nyasa-land, *Whyte*.

460. **Indigofera fusco-setosa**, *Baker* [Leguminosæ-Galegeæ]; ad *I. trachyphyllam*, Benth., e sectione Simplicifoliarum arcte accedit.

Herba perennis, erecta. *Caules* pilis albis araneosis et setis atro-brunneis patulis vestiti. *Folia* subsessilia, simplicia, lineari-oblonga, 1½–2 poll. longa, obtusa, basi rotundata, utrinque sparse pilosa, facie saturate viridia, dorso pallida. *Racemi* axillares, longe pedunculati, densi, oblongi vel oblongo-cylindrici, 2–3 poll. longi, rhachi dense setosi, pedicellis brevibus; bracteæ lineares. *Calyx* brunneus, dense setosus, 3 lin. longus, tubo brevi, dentibus setaceis tubo valde longioribus. *Corolla* atro-purpurea, calyce paulo longior. *Legumen* sessile, lineare, oligospermum, 4 lin. longum, valvis turgidis brunneis setosis.

BRITISH CENTRAL AFRICA. Masuku plateau, alt. 6000–7000 ft. and between Kondowe and Karonga, *Whyte*.

461. **Indigofera lonchocarpifolia**, *Baker* [Leguminosæ-Galegeæ]; ad *I. rhynchocarpam*, Welw., e sectione Tinctoriarum magis accedit.

Suffrutex, ramulis junioribus pubescentibus. *Folia* petiolata imparipinnata, foliolis 7 oppositis oblongis acutis petiolulatis 2–2½ poll. longis facie viridibus glabris dorso pallide viridibus obscure pubescentibus; stipulæ magnæ, scariosæ, caducæ, e basi lata setaceæ. *Racemi* axillares, multiflori, pedunculati, foliis æquilongi, pedicellis brevibus glabris. *Calyx* obliquus, brunneus, 1 lin. longus, parce pilosus, dentibus parvis obtusis. *Corolla* albo-brunnea, 4 lin. longa. *Ovarium* sessile, lineare, multiovulatum.

BRITISH CENTRAL AFRICA. Fort Hill, Nyasa-Tanganyika plateau, alt. 3500–4000 ft., *Whyte*.

462. **Indigofera masukuensis**, *Baker* [Leguminosæ-Galegeæ]; ad *I. Spachii*, Baker, e sectione Tinctoriarum magis accedit.

Suffrutex gracilis. *Ramuli* juniores copiose albo-pilosi, pilis appressis. *Folia* breviter petiolata, imparipinnata, foliolis 9

oblanceolato-oblongis obtusis mucronatis 5–6 lin. longis facie viridibus parce pilosis dorso pallidis dense albo-pilosis; stipulæ setaceæ. *Racemi* multi, axillares, densi, multiflori, breviter pedunculati, pedicellis brevibus et rhachi atro-brunneo-pubescentibus. *Calyx* 2 lin. longus, atro-brunneus, pubescens, tubo brevissimo, dentibus setaceis. *Corolla* brunnea, calyce triplo longior. *Legumen* sessile, lineare, pilosum, polyspermum, 5 lin. longum.

BRITISH CENTRAL AFRICA. Masuku plateau, alt. 6500–7000 ft., *Whyte.*

463. **Tephrosia (Reineria) dissitiflora,** *Baker* [Leguminosæ-Galegeæ]; ad *T. dimorphophyllam,* Welw., magis accedit.

Herba perennis. *Caules* graciles, glabri. *Folia* pinnatim 3–5-foliolata, foliolis lanceolatis subcoriaceis 2½–3 poll. longis obtusis mucronatis utrinque appresse breviter pubescentibus; stipulæ minutæ, lanceolatæ. *Racemi* axillares, laxissimi, longe pedunculati, 3–10 poll. longi, pedicellis brevibus; bracteæ parvæ, lineares. *Calyx* 2 lin. longus, dense pubescens, dentibus lanceolatis vel ovato-lanceolatis tubo longioribus. *Corolla* 4 lin. longa, vexillo dorso dense piloso. *Legumen* lineare, pubescens, rectum, polyspermum, 2½ poll. longum.

BRITISH CENTRAL AFRICA. Mount Zomba and Mount Malosa, alt. 4000–6000 ft., *Whyte.*

464. **Tephrosia (Reineria) zombensis,** *Baker* [Leguminosæ-Galegeæ]; foliis et floribus *T. Vogelii,* Hook. fil., similis, sed calycis dentibus acuminatis tubo valde longioribus dissimilis.

Frutex ramulis lignosis pilis albidis dense vestitus. *Folia* breviter petiolata, 2–3 poll. longa, foliolis 11–15 oblongis obtusis 1½–2 poll. longis facie viridibus glabris dorso albido-sericeis; stipulæ ovatæ, dorso dense pilosæ. *Racemi* densi, subglobosi, pedunculati, terminales; bracteæ lanceolatæ, pubescentes. *Calyx* dense pilosus, 4 lin. longus, dentibus acuminatis tubo valde longioribus. *Corolla* rubra, calyce duplo longior, vexillo orbiculari dorso sericeo. *Ovarium* lineare, pilosum, multiovulatum. *Legumen* maturum ignotum.

BRITISH CENTRAL AFRICA. Mount Zomba, alt. 4000–6000 ft., *Whyte.*

465. **Tephrosia (Reineria) nyikensis,** *Baker* [Leguminosæ-Galegeæ]; ad *T. huillensem,* Welw., magis accedit.

Frutex 6–8-pedalis. *Ramuli* lignosi, sursum dense pilosi. *Folia* breviter petiolata, semipedalia, foliolis 11–13 coriaceis oblanceolatis obtusis mucronatis 1½–2 poll. longis facie viridibus glabris dorso dense pubescentibus; stipulæ lanceolatæ, pubescentes. *Racemi* densi, breves, sæpissime terminales; bracteæ ovatæ, pubescentes. *Calyx* 4 lin. longus, dense pilosus, dentibus lanceolatis acuminatis tubo multo longioribus. *Corolla* calyce duplo longior, vexillo dorso dense sericeo. *Legumen* lineare, polyspermum; 2 poll. longum, pilosum, stylo applanato.

BRITISH CENTRAL AFRICA. Nyika plateau, alt. 6000–7000 ft., *Whyte.*

466. **Tephrosia (Reineria) periculosa**, *Baker* [Leguminosæ-Galegeæ]; ad *T. huillensem*, Welw., magis accedit.

Frutex 6-pedalis. *Ramuli* molliter pubescentes. *Folia* breviter petiolata, 6–8 poll. longa., foliolis 17–19 oblongis obtusis 15–18 lin. longis utrinque dense pubescentibus; stipulæ ovatæ, pilosæ. *Racemi* densi, breves, pedunculati, omnes terminales; bracteæ ovatæ, dense pubescentes. *Calyx* 6 lin. longus, dense brunneo-pilosus, dente infimo lanceolato tubo valde longiore, dentibus reliquis brevioribus obtusis. *Corolla* rubra, pollicaris, vexillo dorso dense sericeo. *Legumen* lineare, pilosum, polyspermum; stylus applanatus, glaber vel leviter pubescens.

BRITISH CENTRAL AFRICA. Between Kondowe and Karonga, *Whyte*, 324. Used by the natives as a fish-poison.

467. **Tephrosia (Reineria) melanocalyx**, *Baker* [Leguminosæ-Galegeæ]; ad *T. huillensem*, Welw., magis accedit.

Suffrutex, ramulis angulatis lignosis dense persistenter fulvo-pubescentibus. *Folia* breviter petiolata, pinnatim 3–5-foliolata, foliolis oblanceolatis obtusis mucronatis 1½–2 poll. longis facie sparse dorso dense pubescentibus; stipulæ lineares, pubescentes. *Racemi* subdensi, 2–4 poll. longi, terminales et axillares; bracteæ lineares, pubescentes. *Calyx* breviter pedicellatus, 4 lin. longus, pilis atro-brunneis dense vestitus, dentibus acuminatis tubo valde longioribus. *Corolla* purpurea, 6 lin. longa, vexillo dorso dense pubescente. *Ovarium* cylindricum, dense pilosum, multiovulatum; stylus applanatus, basi solum pubescens.

BRITISH CENTRAL AFRICA. Near Fort Hill, Nyasa-Tanganyika plateau, alt. 3500–4000 ft., *Whyte*.

468. **Microcharis Galpini**, *N. E. Brown* [Leguminosæ-Galegeæ]; affinis *M. tenellæ*, Benth., sed gracilior, et foliis angustioribus petiolisque longioribus differt.

Caules e basi ramosi, 3–10 poll. alti, herbacei, filiformes, glabri vel pilis minutis paucissimis instructi. *Foliorum* simplicium petioli 2–3 lin. longi; laminæ 6–16 lin. longæ, ¾–1½ latæ, lineares, acutæ, mucronatæ, basi leviter angustatæ, utrinque pilis appressis bifurcis, iis Indigoferarum, nisi quod crura furcæ inæqualia sint, similibus, sparse instructæ; stipulæ subulatæ, ½–2 lin. longæ. *Racemi* 1½–3½ poll. longi, filiformes, glabri, floribus 3–7 distantibus parvis instructi; bracteæ ¾ lin. longæ, setaceæ; pedicelli filiformes, 1½–2½ lin. longi. *Calycis* tubus ½ lin. longus, pilis appressis lateraliter affixis pubescens; dentes ½ lin. longi, subulati. *Corolla* glabra, rubra; vexillum 1¾ lin. longum, 1½ lin. latum, late obovatum, obtusissimum; alæ 2¼ lin. longæ, fere 1 lin. latæ, cuneato-obovatæ, obtusissimæ vel subtruncatæ; carina 2 lin. longa, recta, acuminata. *Legumen* 4–5½ lin. longum, ¾ lin. latum, lineare, 4–6-spermum.

SOUTH AFRICA. Transvaal: summit of Saddleback Mountain, near Barberton, 5000 ft., March, 1891, *Galpin*, 1315.

This is the first species of *Microcharis* that has been found south of the tropic.

469. **Æschynomene (Ochopodium) sparsiflora,** *Baker* [Leguminosæ-Hedysareæ]; ad *Æ. pulchellam*, Planch., habitu magis accedit; recedit floribus magnis sæpissime solitariis.

Herba humilis, perennis, e basi ramosa. *Caules* erecti, gracillimi, sursum pubescentes. *Folia* breviter petiolata, foliolis 4–5-jugis oblongis obtusis 3–4 lin. longis pubescentibus vel glabrescentibus, petiolo seta terminato; stipulæ oblongæ, acutæ, magnæ, persistentes, coriaceæ. *Pedunculi* axillares, breves, sæpissime uniflori. *Calyx* 3–4 lin. longus, pubescens, tubo brevissimo, labiis oblongis obtusis. *Corolla* flava, glabra, 6 lin. longa. *Ovarium* cylindricum, pubescens, biovulatum; stylus brevis incurvatus. *Legumen* maturum ignotum.

BRITISH CENTRAL AFRICA. Nyika plateau, alt. 6000–7000 ft., *Whyte*, 256; between Mpata and the commencement of the Nyasa-Tanganyika plateau, alt. 2000–3000 ft., *Whyte*.

470. **Æschynomene (Ochopodium) nyikensis,** *Baker* [Leguminosæ-Hedysareæ]; ad *Æ. mimosæfoliam*, Vatke, magis accedit.

Frutex 4–6-pedalis. *Ramuli* lignosi, recti, teretes, sursum glanduloso-pubescentes. *Folia* subsessilia, 3–4 lin. longa, foliolis 10–12-jugis linearibus rigide coriaceis imbricatis $\frac{3}{4}$ lin. longis oblique mucronatis; stipulæ parvæ, lanceolatæ, caducæ, infra insertionem haud productæ. *Racemi* laxi, pauciflori, in paniculam amplam terminalem aggregati; bracteæ lanceolatæ, coriaceæ, persistentes. *Calyx* 4 lin. longus, labio inferiore oblongo apice tridentato quam superiore longiore. *Corolla* lutea, glabra, 6 lin. longa. *Legumen* glabrum, breviter stipitatum, articulis 2 planis dimidiato-orbicularibus 4 lin. longis.

BRITISH CENTRAL AFRICA. Nyika plateau, alt. 6000-7000 ft., a common showy shrub, *Whyte*.

471. **Æschynomene dissitiflora,** *Baker* [Leguminosæ-Hedysareæ]; inter sectiones *Euæschynomenen* et *Ochopodium* medium tenens; e stipulis ad priorem, e habitu et fructu ad posteriorem attinens.

Fruticosa ramulis teretibus lignosis sursum pubescentibus gracilis. *Folia* breviter petiolata, foliolis crebris 10-jugis lineari-oblongis 4–5 lin. longis apice obtusis emarginatis mucronatis; stipulæ magnæ, lanceolatæ, coriaceæ, infra insertionem productæ. *Racemi* laxi, elongati, axillares, apice 1–2-flori, nodis inferioribus bracteis 2 ovatis coriaceis persistentibus præditis. *Calyx* pubescens, 2 lin. longus, labiis ovatis, inferiore majore. *Corolla* lutea, glabra, 5 lin. longa. *Legumen* breviter stipitatum, glabrum, articulis 1–2 suborbicularibus $1\frac{1}{2}$–2 lin. latis.

BRITISH CENTRAL AFRICA. Fort Hill, Nyasa-Tanganyika plateau, alt. 3500–4000 ft., *Whyte*.

472. **Smithia (Kotschya) congesta,** *Baker* [Leguminosæ-Hedysareæ]; ad *S. recurvifoliam*, Taubert, magis accedit.

Suffrutex ramosus. *Ramuli* ascendentes, lignosi, dense pubescentes. *Folia* subsessilia, foliolis 4-jugis lanceolatis mucronatis recurvatis rigide coriaceis 3–4 lin. longis, rhachi decurvato in

setam desinente ; stipulæ ovato-lanceolatæ, rigide coriaceæ, persistentes. *Racemi* pauciflori, axillares, congesti, breviter pedunculati, rhachi setis stramineis magnis prædito. *Calyx* tubulosus, 4 lin. longus, strigosus, tubo brevi, dente supremo oblanceolato obtuso, infimis brevioribus linearibus ; bracteolæ 2, ovatæ, acutæ, coriaceæ, persistentes, ad basin calycis appressæ. *Corolla* lutea, 6 lin. longa. *Ovarium* pubescens, torulosum, biovulatum ; stylus elongatus incurvatus. *Legumen* maturum ignotum.

BRITISH CENTRAL AFRICA. Masuku plateau, alt. 6500–7000 ft., *Whyte.*

473. **Smithia (Kotschya) drepanophylla**, *Baker* [Leguminosæ-Hedysareæ] ; ad *S. recurvifoliam*, Taubert, magis accedit.

Frutex, ramis lignosis teretibus dense pubescens. *Folia* subsessilia, falcata, 6 lin. longa, foliolis 8–9-jugis lanceolatis recurvatis rigide coriaceis 2 lin. longis imbricatis oblique mucronatis; stipulæ parvæ, lanceolatæ, infra insertionem haud productæ. *Racemi* pauciflori, axillares, breviter pedunculati, rhachi setis luteis magnis strigosi ; bracteæ ovatæ, coriaceæ, persistentes. *Calyx* pubescens, 3 lin. longus, labiis oblongis obtusis, superiore majore ; bracteolæ ovatæ, persistentes. *Corolla* lutea, glabra, calyce duplo longior. *Ovarium* pubescens, biovulatum. *Legumen* maturum ignotum.

BRITISH CENTRAL AFRICA. Between Kondowe and Karonga, *Whyte.*

474. **Smithia (Kotschya) sphærocephala**, *Baker* [Leguminosæ-Hedysareæ] ; ad S. *capituliferam*, Welw., magis accedit.

Rami teretes, recti, sursum pubescentes. *Folia* breviter petiolata, 9–21 lin. longa, foliolis 9–10-jugis dimidiato-oblongis 2–4 lin. longis rigide coriaceis imbricatis ; stipulæ parvæ, lanceolatæ, caducæ, infra insertionem haud productæ. *Flores* in capitulis densis globosis axillaribus breviter pedunculatis aggregati ; bracteæ persistentes, ovato-lanceolatæ ; eæ et rhachis setis luteis stigosæ. *Calyx* 2–3 lin. longus, strigosus, labiis ovatis ; bracteolæ 2 ovatæ, coriaceæ, persistentes, ad basin appressæ. *Corolla* lutea, calyce duplo longior, vexillo orbiculari extus glabro. *Ovarium* pubescens, biovulatum. *Legumen* maturum ignotum.

BRITISH CENTRAL AFRICA. Between Kondowe and Karonga, *Whyte.*

475. **Geissapsis drepanocephala**, *Baker* [Leguminosæ-Hedysareæ] ; ad *G cristatam*, Wight et Arn., magis accedit.

Herba perennis, erecta, glabra. *Rami* graciles, ascendentes, teretes. *Folia* breviter petiolata, pinnata vel digitata, foliolis sæpissime bijugis obovatis emarginatis 9–12 lin. longis, petiolo in cirrho minuto setiformi terminata ; stipulæ magnæ, ovatæ, subcoriaceæ, basi inæqualiter auriculatæ. *Racemi* axillares, breviter pedunculati, oblongi, deflexi, pedicellis brevibus ; bracteæ imbricatæ, persistentes, orbiculares, emarginatæ, complicatæ, 5–6 lin. longæ et latæ, margine haud ciliatæ. *Calyx* minutus, labiis ovatis. *Legumen* dispermum, bractea brevius, articulis planis 2 lin. latis.

British Central Africa. Nyika plateau, alt. 6000–7000 ft., and between Mpata and the commencement of the Nyasa-Tanganyika plateau, alt. 2000–3000 ft., *Whyte.*

476. **Lathyrus intricatus**, *Baker* [Leguminosæ-Vicieæ]; ad *L. kilimandscharicum*, Taubert, arcte accedit.

Caules intricati, graciles, angulati, adolescentes glabri, juniores obscure pubescentes. *Folia* breviter petiolata, foliolis unijugis linearibus vel lanceolatis glabris 1½–2 poll. longis; stipulæ sagittatæ, lanceolatæ, auriculis linearibus; cirrhus terminalis, elongatus, tortuosus. *Flores* 1–2-ni, pedunculis brevibus, pedicellis pubescentibus calyce brevioribus; bracteæ 3–4, lanceolatæ, segregatæ, persistentes. *Calyx* 3 lin. longus, dentibus lanceolatis acuminatis tubo campanulato æquilongis. *Corolla* rubra, 4–5 lin. longa. *Legumen* lineare, planum, glabrum, 12–18 lin. longum, 2 lin. latum, 6–9-spermum, ad apicem attenuatum; stylus subulatus, rectus vel curvatus, 2 lin. longus.

British Central Africa. Nyika plateau, alt. 5000–6000 ft.; Masuku plateau, alt. 6500–7000 ft.; Fort Hill, Nyasa-Tanganyika plateau, and between Mpata and the commencement of the Nyasa-Tanganyika plateau, alt. 3000 ft., *Whyte.*

477. **Lathyrus malosanus**, *Baker* [Leguminosæ-Vicieæ]; ab *L. kilimandscharico*, Taubert, et *L. hygrophilo*, Taubert, recedit pedunculo foliolis longiore 1-4-floro.

Caules graciles, angulati, inferne glabri, superne leviter pilosi. *Folia* sessilia, foliolis linearibus unijugis 1 poll. longis; stipulæ lineares, deflexæ; cirrhus terminalis, elongatus, contortus. *Pedunculi* 1½–2 poll. longi, 1–4-flori; bracteæ nullæ vel deciduæ; pedicelli pubescentes, calyce breviores. *Calyx* 2 lin. longus, tubo campanulato pubescente, dentibus lanceolatis tubo brevioribus. *Petala* rubella; vexillum obovatum, 4 lin. longum. *Legumen* lineare, glabrum, 3–4-spermum, 1 poll. longum, 2 lin. latum, ad apicem sensim attenuatum; stylus brevis, incurvatus.

British Central Africa. Mount Malosa, near Zomba, 4,000–6,000 ft., *Whyte.*

478. **Vigna malosana**, *Baker* [Leguminosæ-Phaseoleæ]; ad *V. angivensem*, Baker, madagascariensem, arcte accedit.

Herba perennis. *Caules* breves, graciles, volubiles, glabri. *Folia* breviter petiolata, pinnatim trifoliolata, foliolo terminali parvo stipellato ovato vel ovato-lanceolato utrinque viridi glabro; stipulæ ovatæ, persistentes, basi auriculati. *Pedunculi* elongati, 1–2-flori, pedicellis brevibus; bracteolæ persistentes, ad calycem appressæ. *Calyx* glaber, 2 lin longus, tubo campanulato, dentibus acutis parvis inæqualibus. *Corolla* 7 lin. longa, vexillo rubello glabro, carina pallida curvata obtusa. *Legumen* lineare, glabrum, polyspermum.

British Central Africa. Mount Malosa, near Zomba, alt. 4000–6000 ft., *Whyte.*

479. **Dolichos trinervatus,** *Baker* [Leguminosæ-Phaseoleæ]; ad *D. erectum*, Baker fil., magis accedit.

Herba 3-pedalis, erecta. *Ramuli* virgati, graciles, teretes, pubescentes. *Folia* pinnatim trifoliolata, breviter petiolata, foliolis linearibus subcoriaceis 5–6 poll. longis e basi ad apicem conspicue trinervatis utrinque pubescentibus; stipulæ parvæ, caducæ. *Racemi* axillares et terminales, breves, densi, multiflori, pedicellis demum 2 lin. longis; bracteæ lanceolatæ, sericeæ. *Calyx* pilosus, 4 lin. longus, dentibus acuminatis tubo campanulato longioribus. *Corolla* 8–9 lin. longa, rubro-lilacina, vexillo 5–6 lin. diam. dorso glabro. *Legumen* lineare, pilosum, rectum, paucispermum, 1 poll. longum.

British Central Africa. Between the Songwe River and Karonga, alt. 1700–2000 ft., *Whyte*. Shire Highlands, *Buchanan*, (1881 collection), 406.

480. **Dolichos malosanus,** *Baker* [Leguminosæ-Phaseoleæ]; ad *D. erectum*, Baker fil., magis accedit.

Frutex erecta. Ramuli lignosi, dense pubescentes. *Folia* longe petiolata, pinnatim trifoliolata, foliolis ovatis vel oblongis acutis basi late rotundatis $1\frac{1}{2}$–2 poll. longis utrinque pilosis; stipulæ nullæ vel cito caducæ. *Racemi* subdensi, terminales, 6–8 poll. longi, pedicellis brevibus ascendentibus dense pilosis; bracteolæ subulatæ. *Calyx* campanulatus, dense pilosus, 2 lin. longus, dentibus parvis ovatis. *Corolla* saturate purpurea, 9 lin. longa, vexillo obovato 6 lin. lato dorso glabro. *Ovarium* stipitatum, cylindricum, molliter pilosum, pauciovulatum; stylus elongatus, incurvatus applanatus, sursum pubescens, stigmate obliquo penicillato.

British Central Africa. Mount Malosa, near Zomba, alt. 4000–6000 ft., *Whyte*.

481. **Dolichos shuterioides,** *Baker* [Leguminosæ-Phaseoleæ]; ad *D. axillarem*, E. Mey., et *D. formosum*, A. Rich., magis accedit.

Herba volubilis. *Caules* graciles, dense breviter pubescentes. *Folia* petiolata, pinnatim trifoliolata, foliolis membranaceis utrinque pilosis, foliolo terminali ovato acuto $1\frac{1}{2}$–2 poll. longo. *Racemi* axillares, pedunculati, pauciflori, pedicellis pilosis calyce brevioribus; bracteæ magnæ, scariosæ, oblongæ, nervosæ, subpersistentes. *Calyx* pilosus, 3 lin. longus, dente infimo lanceolato tubo æquilongo, reliquis ovatis acuminatis brevioribus. *Corolla* purpurea, calyce duplo longior, vexillo obovato dorso glabro. *Legumen* lineare, curvatum, planum, glabrum, polyspermum, 2 poll. longum.

British Central Africa. Masuku plateau, alt. 6500–7000 ft., *Whyte*, 275.

482. **Rhynchosia (Cyanospermum) floribunda,** *Baker* [Leguminosæ-Phaseoleæ]; ad *R. calycinam*, Guill. et Perr., magis accedit.

Caules lignosi, sarmentosi, juniores pilis sæpe glanduliferis dense pubescentes. *Folia* distincte petiolata, pinnatim trifoliolata,

foliolis subcoriaceis obtusis integris sparse pubescentibus e basi ad medium trinervatis, terminali obovato 2–3 poll. longo; stipulæ lanceolatæ, parvæ. *Pedunculi* lignosi, axillares, elongati, furcati. *Racemi* densi, 2–4 poll. longi, pedicellis calyce vix longioribus dense glanduloso-pubescentibus; bracteæ magnæ, ovatæ, pubescentes. *Calyx*, flore expanso, 4 lin. longus, dense glanduloso-pubescens, dentibus obtusis tubo campanulato subæquilongis. *Corolla* saturate rubra, extus leviter pubescens, calyce dimidio longior. *Legumen* lineari-oblongum, dispermum, pubescens, 6 lin. longum.

BRITISH CENTRAL AFRICA. Fort Hill, Nyasa-Tanganyika plateau, alt. 3500-4000 ft., *Whyte*.

483. **Rhynchosia nyasica,** *Baker* [Leguminosæ-Phaseoleæ]; ad *R. splendentem*, Schweinf., et *R. Memnoniam*, DC., accedit.

Caules erecti, graciles, lignosi, pilis reflexis haud glanduliferis dense pubescentes. *Folia* petiolata, pinnatim trifoliolata, subcoriacea, utrinque dense pubescentia, foliolo terminali cordato-orbiculari integro subacuto 12–18 lin. longo et lato; stipulæ parvæ, lanceolatæ. *Racemi* axillares, laxi, subsessiles, pauciflori, rhachibus dense pubescentibus, pedicellis brevissimis; bracteæ parvæ, caducæ. *Calyx* pubescens, 2 lin. longus, dente infimo lanceolato tubo æquilongo, dentibus superioribus connatis brevioribus. *Corolla* 6 lin. longa, vexillo pubescente flavido venis longitudinalibus nigris percurso. *Ovarium* cylindricum, pilosum, pauciovulatum; stylus elongatus, incurvatus. *Legumen* ignotum.

BRITISH CENTRAL AFRICA. Between Kondowe and Karonga, alt. 2000–6000 ft., *Whyte*.

484. **Rhynchosia imbricata,** *Baker* [Leguminosæ-Phaseoleæ]; ad *R. Memnoniam*, DC., magis accedit.

Caules recti, lignosi, pilis mollibus patentibus haud glanduliferis dense persistenterque pilosi. *Folia* breviter petiolata, pinnatim trifoliolata, foliolis imbricatis cordato-orbicularibus cuspidatis integris utrinque pubescentibus, terminali $1\frac{1}{2}$–$2\frac{1}{2}$ poll. longo et lato; stipulæ parvæ, lanceolatæ. *Racemi* axillares, dense pubescentes, superiores elongati multiflori, inferiores breves pauciflori; pedicelli brevissimi; bracteæ parvæ, lanceolatæ. *Calyx* dense pubescens, 3 lin. longus, tubo campanulato, dentibus ovato-acuminatis tubo paulo brevioribus. *Corolla* 6 lin. longa, vexillo pubescente flavo-viridi venis longitudinalibus atropurpureis apice anastomosantibus percurso. *Ovarium* cylindricum, dense pubescens, pauciovulatum; stylus longus, incurvatus, glaber. *Legumen* ignotum.

BRITISH CENTRAL AFRICA. Between Mpata and the commencement of the Nyasa-Tanganyika plateau, alt. 2000–3000 ft., *Whyte*.

485. **Rhynchosia nyikensis,** *Baker* [Leguminosæ-Phaseoleæ] ad *R. ferrugineam*, A. Rich., magis accedit.

Caules lignosi, graciles, sarmentosi, superne pilis læte brunneis raro apice glanduliferis dense pubescentes. *Folia* distincte

petiolata, pinnatim trifoliolata, facie saturate viridia, sparse pubescentia, dorso dense pubescentia, foliolo terminali ovato integro acuto 18–21 lin. longo; stipulæ parvæ, ovatæ. *Racemi* densi, multiflori, pedunculati, terminales et laterales, rhachibus dense pubescentes, pedicellis brevibus; bracteæ magnæ, obovato-cuspidatæ, pubescentes. *Calyx* dense pubescens, 5–6 lin. longus, dentibus inæqualibus lanceolatis tubo æquilongis vel paulo longioribus. *Corolla* calyce paulo longior, vexillo rubro dorso pubescente. *Ovarium* dense pilosum, pauciovulatum; stylus elongatus, incurvatus, pubescens. *Legumen* ignotum.

BRITISH CENTRAL AFRICA. Nyika plateau, alt. 6000–7000 ft., and between Mpata and the Nyasa-Tanganyika plateau, alt. 2000–3000 ft., *Whyte.*

486. **Rhynchosia divaricata,** *Baker* [Leguminosæ-Phaseoleæ]; ad *R. viscosam*, DC., magis accedit.

Caules graciles, lignosi, sursum pilis brevibus sæpe glanduliferis dense pubescentes. *Folia* petiolata, pinnatim trifoliolata, facie viridia sparse pubescentia, dorso albida dense pubescentia, foliolo terminali ovato acuto integro 2 poll. longo; stipulæ parvæ, lanceolatæ. *Paniculæ* amplæ, laxæ, terminales, ramis dense glanduloso-pubescentes, racemis paucifloris, pedicellis infimis calyci æquilongis; bracteæ parvæ, ovatæ, caduceæ. *Calyx* 3 lin. longus, dense pubescens, dentibus lanceolatis tubo campanulato æquilongis. *Corolla* calyce duplo longior, vexillo obovato extus pubescente atro-purpureo albo variegato. *Ovarium* dense pilosum. *Legumen* 1½ poll. longum, dense pilosum.

BRITISH CENTRAL AFRICA. Nyika plateau, alt. 6000–7000 ft., *Whyte.*

487. **Rhynchosia sphærocephala,** *Baker* [Leguminosæ - Phaseoleæ]; ad *R. viscosam*, DC., et *R. caribæam*, DC., accedit.

Caules volubiles, graciles, pilis appressis haud glanduliferis pubescentes. *Folia* longe petiolata, pinnatim trifoliolata, foliolis ovatis integris pubescentibus 1–2 poll. longis; stipulæ pubescentes, lanceolatæ, persistentes. *Racemi* axillares, densi, pauciflori, pedunculati, pedicellis brevissimis; bracteæ lanceolatæ, calyce breviores. *Calyx* dense pubescens, 3 lin. longus, tubo, campanulato, dente infimo lanceolata tubo æquilongo, dentibus reliquis latioribus brevioribus. *Corolla* calyce duplo longior, rubro-purpurea, vexillo orbiculari glabro, carina breviter rostata. *Ovarium* cylindricum, pubescens, pauciovulatum; stylus, longus, incurvatus, apice penicillatus. *Legumen* ignotum.

BRITISH CENTRAL AFRICA. Nyika plateau, alt. 6000–7000 ft., common, *Whyte*, 211.

488. **Eriosema cryptanthum,** *Baker* [Leguminosæ-Phaseoleæ]; inter *E. cajanoides*, Hook, fil., et *E. montanum*, Baker fil., medium tenens.

Frutex ramulis lignosis rectis dense persistenter albido-pubescens. *Folia* breviter petiolata, ascendentia, digitatim trifoliolata, foliolis oblanceolato-oblongis acutis e medio ad basin sensim

angustatis, venulis facie dorsali elevatis, foliolo terminali 18–21 lin. longo, lateralibus minoribus; stipulæ magnæ, lineares. *Racemi* terminales, densi, subglobosi, foliis ascendentibus occulti; pedicelli brevissimi; bracteæ lineares, pubescentes. *Calyx* pubescens, 3 lin. longus, dentibus deltoideis tubo campanulato æquilongis. *Corolla* calyce paulo longior. *Ovarium* oblongo-cylindricum, pubescens, biovulatum. *Legumen* ignotum.

British Central Africa. Plateau of Mount Zomba, alt. 5000–6000 ft., *Whyte.*

489. **Berlinia densiflora,** *Baker* [Leguminosæ-Cæsalpinieæ]; ad *B. angolensem*, Welw., magis accedit.

Arbor erecta. *Ramuli* lignosi, crassi, glabri. *Folia* distincte petiolata, foliolis 3–4-jugis petiolulatis oblongis obtusis coriaceis glabris $2\frac{1}{2}$—$4\frac{1}{2}$ poll. longis. *Paniculæ* densæ, terminales, ramis inferioribus axillaribus et ramulis brunneo-pubescentes; bracteolæ obovatæ, cucullatæ, coriaceæ, persistentes, 4 lin. longæ, brunneo-velutinæ. *Calyx* abortivus. *Petala* subæqualia, angusta, unguiculata, bracteolis breviora. *Stamina* petalis valde longiora. *Ovarium* oblongum, dense pilosum, pauciovulatum, stipite brevi crasso; stylus elongatus. *Legumen* ignotum.

British Central Africa. Nyika plateau, alt. 6000–7000 ft., *Whyte.*

490. **Parinarium (Sarcostegia) floribundum,** *Baker* [Rosaceæ-Chrysobalaneæ]; ad *P. polyandrum*, Benth., magis accedit.

Arbor ramulis validis lignosis glabra. *Folia* breviter petiolata, oblonga, obtusa, 4–5 poll. longa, coriacea, basi rotundata, utrinque glabra, facie nitida griseo-viridia, dorso pallida. *Paniculæ* corymbosæ, terminales et laterales, densæ, 4–6 poll. latæ, pediculis erectis crassis glabris. *Calycis* tubus turbinatus 2 lin. longus, haud gibbosus, intus solidus; limbi segmenta orbicularia, 2 lin. longa et lata, valde imbricata, exteriora glabra, interiora marginibus incana. *Petala* orbicularia, sepala vix superantia. *Stamina* permulta, antheris oblongis parvis, filamentis contortis 5–6 lin. longis. *Ovarium* dense pilosum; stylus elongatus, contortus. *Fructus* ignotus.

British Central Africa. Fort Hill Nyasa-Tanganyika plateau, alt. 3500–4000 ft., *Whyte.*

491. **Crassula nyikensis,** *Baker* [Crassulaceæ]; ad *C. globularioidem*, Britten, magis accedit.

Herba perennis, e basi valde ramosa. *Folia* rosularum sterilium obovato-cuneata, carnosa, viridia, sessilia, 4 lin. longa, facie glabra, marginibus setis albis dense ciliata. *Caules* floriferi 2–4 poll. longi, ad apicem foliis reductis oppositis decussatis præditi. *Flores* in cymas dichotomas compositas dense congesti. *Sepala* 5, carnosa, glabra, lanceolata, $\frac{3}{4}$ lin. longa, marginibus haud ciliata. *Petala* oblanceolata, obtusa, alba, sepalis sesqui-longiora. *Stamina* petalis breviora, antheris parvis purpureis globosis. *Carpella* staminibus æquilonga.

British Central Africa. Highest ridges of the Nyika Mountains, alt. 7500 ft., on bare gneiss and granite rocks, *Whyte.*

492. **Crassula zombensis,** *Baker* [Crassulaceæ]; ad *C. abyssinicam*, A. Rich., magis accedit.

Herba perennis, humilis, e basi ramosa. *Caules foliiferi* breves, cæspitosi. *Folia* crebra, opposita, basi connata, ascendentia, lanceolata, obtusa, 6–9 lin. longa, utrinque albo-hispida, marginibus setis albidis ciliata. *Caules floriferi* breves, graciles, erecti, pubescentes, foliis 1–2-jugis valde reductis solum præditi. *Cymæ* plures, in paniculam parvam thyrsoideam aggregatæ; pedicelli breves, pubescentes. *Calyx* ½ lin. longus, segmentis 5 lanceolatis pubescentibus. *Petala* lanceolata, calyce duplo longiora. *Stamina* petalis breviora, antheris globosis minutis. *Carpella* staminibus æquilonga.

British Central Africa. Rocks of Mount Zomba, alt. 4000–6000 ft., *Whyte*.

493. **Kalanchoe flammea,** *Stapf* [Crassulaceae]; proxim- *K. glaucescenti*, Britten, sed foliis brevioribus brevius pedia cellatis, calycis segmentis liberis vel subliberis, corollae tubi et loborum proportione diversa.

Perennis circiter 1½ ped. alta, glaberrima. *Caulis* parce ramosus, crebre foliatus. *Folia* obovato-oblonga, obtusa, abrupte vel sensim in petiolum attenuata, intermedia majora, circiter 2 poll. longa, 1¼–1½ poll. lata, vix glauca, crasse carnosa, integra vel obscure repando-crenata; petioli ½ poll. longi, ¼–⅓ poll. lati. *Cymae* in corymbum densum, 3–3½ poll. latum dispositae; pedunculi 2–4 poll. longi; rami inferiores 1½–3 poll. longi; pedicelli 2–3 lin. longi. *Bracteæ* lineares, obtusiusculæ, ad 2 lin. longae, caducæ. *Flores* 4–meri. *Calyx* ad basin partitus, segmentis liberis vel basi tenuissime connexis angustis lineari-lanceolatis acutiusculis 2–2½ lin. longis. *Corollae* tubus 4–angulus, 4½–5 lin. longus, flavescens; lobi ovati, acuti vel cuspidati, 3½–4 lin. longi, 2½–3 lin. lati, rubro-aurantiaci. *Glandulæ* lineares, 1 lin. longæ. *Carpella* 3 lin. longa; styli 1 lin. longi.

British East Africa. Somaliland, *Miss Cole*, (Cult. in horto Kewensi).

494. **Trichocladus malosanus,** *Baker* [Hamamelideæ]; ad *T. ellipticum*, Eckl. et Zeyh., magis accedit.

Arbor, ramulis lignosis apice albo-incanis. *Folia* alterna, breviter petiolata, oblonga, integra, subacuta, 2–3 poll. longa, subcoriacea, facie glabra, dorso albido-incana. *Flores* polygami, in capitulas densas globosas terminales et axillares aggregati. *Calyx* parvus, campanulatus, pilis stellatis brunneis lepidotus, dentibus 5 parvis obtusis. *Petala* 5, subulata, falcata, glabra, brunnea, 3–4 lin. longa. *Stamina* brevia, filamentis latis brevissimis, antheris valva laterali dehiscentibus. *Ovarium* 2-loculare, ovulis solitariis pendulis; styli breves. *Fructus* ignotus.

British Central Africa. Mount Malosa, alt. 4000–6000 ft., *Whyte*. This discovery adds a curious Cape genus to the flora of Tropical Africa.

495. **Weihea malosana,** *Baker* [Rhizophoreæ]; ad *W. africanam*, Benth., arcte accedit.

Arbor, ramulis lignosis sursum leviter pilosis. *Folia* breviter petiolata, opposita, oblonga, obtusa, subcoriacea, inciso-crenata, facie glabra, dorso ad costam pubescentia. *Flores* 1–2-ni, axillares et terminales, pedicellis brevibus pilosis. *Calyx* 3 lin, longus, parce pilosus, tubo brevi, lobis 5 ovato-lanceolatis. *Petala* calyce paulo longiora, angusta, unguiculata, apice laciniata. *Stamina* circiter 20, calyci æquilonga, antheris oblongis parvis, filamentis subulatis glabris. *Ovarium* globosum, basi ad calycem adnatum; stylus staminibus æquilongus, subulatus. *Fructus* ignotus.

BRITISH CENTRAL AFRICA. Mount Malosa, near Zomba, alt. 4000–5000 ft., *Whyte.*

496. **Cacoucia Barteri,** *Hemsley* [Combretaceæ]; a *C. paniculata*, Laws., foliis tenuibus longiuscule petiolatis floribus minoribus recedit.

Rami floriferi graciles, glabri. *Folia* subopposita, fere membranacea, glabra, oblonga, circiter semipollicaria, acute acuminata, basi rotundata. *Racemi* graciles, flexuosi, atque flores pubescentes, pedicellis brevibus; bracteæ angustæ, quam flores breviores, cito deciduæ. *Flores* absque staminibus exsertis circiter 9 lin. longi, fere recti.—*C. paniculata*, Laws. in Oliver's *Fl. Trop. Afr.* II. p. 434, partim.

WEST TROPICAL AFRICA. Onitsha, *Barter*, 1857.

497. **Eugenia (Syzygium) masukuensis,** *Baker* [Myrtaceæ]; inter *E. owariensem* Beauv., et *E. cordatam*, Laws., medium tenens.

Arbor, ramulis lignosis virgatis 4-angulatis glabris. *Folia* breviter petiolata, oblonga, acuta, crassa, rigide coriacea, 2–3 poll. longa, basi late rotundata, utrinque glabra, venulis immersis. *Cymæ* multifloræ, globosæ, in paniculam corymbosam 2–3 poll. diam. aggregatæ. *Calyx* sessilis, obconicus, brunneus, glaber, 2 lin. longus, dentibus parvis semiorbicularibus. *Stamina* calyce breviora. *Petala* oblonga, calyce breviora.

BRITISH CENTRAL AFRICA. Masuku plateau, alt 6500–7000 ft., *Whyte.*

498. **Dissotis Whytei,** *Baker* [Melastomaceæ]; ad *D. johnstonianam*, Baker fil., arcte accedit.

Frutex ramulis lignosis 4-angulatis scabris sulcatis validus. *Folia* brevissime petiolata, oblonga, acuta, 3 poll. longa, basi late rotundata, e basi ad apicem 5-nervia, facie viridia scabra, dorso flavo-viridia etiam scabra. *Cymæ* ad apices ramulorum in paniculam parvam congestæ; bracteæ cito deciduæ; pedicelli brevissimi, scabri. *Calycis* tubus campanulatus, 3 lin. longus, setis brevibus sparsis ascendentibus albidis munitus; lobi 5, semiorbiculares, parvi, patuli, persistentes. *Petala* obovato-cuneata, violacea, 6 lin. longa. *Antheræ* majores 3 lin. longæ, connectivo elongato basi antice producto.

BRITISH CENTRAL AFRICA. Mount Zomba, alt. 4000–6060 ft., *Whyte.*

499. **Memecylon flavovirens**, *Baker* [Melastomaceæ] ; ad *M. angulatum*, Reichb., magis accedit.

Frutex omnino glaber. *Ramuli* lignosi, superne 4-angulati, nodis incrassati. *Folia* sessilia, obovato-cuneata, 2–3 poll. longa, apice obtusa vel minute emarginata, flavo-viridia, penninervia, venis primariis erecto-patentibus. *Cymæ* simplices, pauciflore, axillares, breviter pedunculatæ vel sessiles ; pedicelli calycibus longiores. *Calyx* campanulatus, limbo patulo obscure dentato, 1 lin. diam. *Fructus* globosus, 3–4 lin. diam., calyce persistenter coronatus.

British Central Africa. North Nyasa-land, *Whyte*.

500. **Trianthema nyasica**, *Baker* [Ficoideæ] ; ad *T. crystallinam*, Vahl, accedit.

Herba perennis. *Caules* graciles, glabri, decumbentes ramosissimi. *Folia* sessilia, oblanceolata, subcarnosa, glabra, obtusa, 4 lin. longa. *Flores* permulti, sessiles, axillares. *Calycis* tubus infundibularis, 2 lin. longus ; lobi 5, patuli, ovati, acuti, tubo æquilongi. *Capsula* conica, membranacea, unilocularis, polysperma, medio circumscissa. *Semina* atra, reniformia, rugosa.

British Central Africa. Monkey Bay, Lake Nyasa, alt. 1600 ft., *Whyte*.

501. **Peucedanum Buchanani**, *Baker* [Umbelliferæ]; ad *P. Grantii*, Kingston, magis accedit.

Herba gracilis, ramosa, erecta, glabra. *Caules* leves, profunde sulcati. *Folia* inferiora ignota ; caulina breviter petiolata, ternata, segmentis lanceolatis acutis serratis. *Umbellæ* primariæ 6–8-radiatæ, bracteis involucri obsoletis ; umbellæ secundariæ 8–9-floræ, bracteis linearibus minutis. *Calycis* dentes obsoleti. *Petala* alba. *Fructus* planus, oblongus, 3 lin. longus, jugis dorsalibus inconspicuis, lateralibus in alas latas pallidas productis.

British Central Africa. Nyika plateau, alt. 6000–7000 ft., *Whyte* ; Shire Highlands, *Buchanan* (1878 collection), 167.

502. **Peucedanum heracleoides**, *Baker* [Umbelliferæ]; ad *P. altum*, Hiern, magis accedit.

Herba erecta, elata, robusta, habitu *Heracleo Sphondylio* similis. *Caules* validi, multisulcati, superne scabri. *Folia* radicalia ignota ; caulina simpliciter pinnata, segmentis 3–5, magnis obovatis crenatis, infimis furcatis. *Umbellæ* primariæ 15–20-radiatæ, involucri bracteis linearibus persistentibus 12–15 lin. longis ; umbellæ secundariæ multifloræ, bracteis consimilibus multo minoribus. *Calycis* lobi obsoleti. *Petala* alba. *Fructus* obovatus, planus, 4 lin. longus, jugis dorsalibus 3 elevatis, 2 lateralibus in alas 1 lin. latas productis ; vittae solitariae ; carpophorum tenue, medio furcatum.

British Central Africa. Nyika plateau, alt. 6000–7000 ft., *Whyte*, 224.

503. **Peucedanum valerianæfolium,** *Baker* [Umbelliferæ]; a speciebus reliquis africanis facile distinguitur foliis radicalibus integris caulinis lyrato-pinnatifidis.

Herba perennis, gracilis, erecta, glabra. *Caules* leves, profunde sulcati. *Folia* inferiora distincte petiolata, parva, oblonga, acuta, obscure crenata, basi longe cuneata; caulina lyrato-pinnatifida. *Umbellæ* primariæ 6–8-radiatæ, bracteis minutis linearibus albo-marginatis caducis; umbellæ secundariæ multifloræ, bracteis minutis linearibus. *Calycis* lobi obsoleti. *Petala* alba. *Fructus* oblongus, planus, jugis dorsalibus haud prominentibus, lateralibus in alas latas productis.

British Central Africa. Mount Zomba, alt. 4000–6000 ft., *Whyte.*

504. **Vernonia humilis,** *C. H. Wright* [Compositæ-Vernoniaceæ]; pubescens, foliis oblongis acutis glandulosis, capitulis 4–6-floris.

Caulis herbaceus vel sublignosus, pubescens, 10 poll. altus *Folia* 1 poll. longa, 4–5 lin. lata, alterna, oblonga, basi apiceque acuta, brevissime petiolata, dentata, glandulis aureis pellucidis punctata. *Capitula* 4–6-flora, 4 lin. longa, in corymbos terminales disposita. *Involucrum* campanulatum, bracteis paucis imbricatis ovatis obtusis marginibus scariosis. *Corolla* regulariter tubulosa. *Antheræ* basi obtusæ, apice appendices triangulares scariosas gerentes. *Stylus* bipartitus. *Achænia* leviter striata. *Pappi* seti filiformes, scabri.

Tropical Africa. German East Africa: Lower plateau, north of Lake Nyasa, *J. Thomson.* British Central Africa: Mt. Mlanje, 6000 ft., *McClounie*, 30.

The leaves contain numerous pellucid glands, on the surface of which in the more recent specimens are golden globules. In older specimens the surfaces of the leaves appear densely punctate.

505. **Helichrysum concinnum,** *N. E. Brown* [Compositæ-Inuloideæ]; *H. cochleariformi*, DC., propinquum sed capitulis minoribus pallidioribus oblongis differt.

Herba 6 poll. alta, e basi ramosa. *Caules* graciles, erecti, supra paniculato-ramosi, laxe foliosi, lanato-tomentosi. *Folia* linearia vel lineari-oblonga, 3–6 lin. longa, $\frac{1}{2}$–1 lin. lata, sessilia, utrinque lanata, apice fusco-apiculata. *Capitula* 2 lin. longa, $1\frac{1}{2}$–$1\frac{3}{4}$ lin. diam., laxe comymboso-paniculata, pedicellata, oblonga, 50–60-flora. *Involucri* campanulati squamæ luteo-fulvæ, bullato-imbricatæ, lineari-oblongæ, subacutæ, apice subcucullato-concavæ. *Flores* exteriores filiformes; interiores tubulosi, 5-dentati. *Pappi* setæ apice breviter incrassatæ.—*H. cochleariforme*, Harv. in *Harv. & Sond. Fl. Cap.* III. p. 220, non DC.

South Africa. Little Namaqualand: near Ezels Fontein and Rood Berg, 3500–4000 ft., November, *Drège.*

This plant was assigned by Harvey to *H. cochleariforme*, DC., but it is perfectly distinct from that species, although allied to it, differing in its more numerous, much smaller, oblong, and much

paler coloured flower-heads. In *H. cochleariforme*, DC. (*H. stellatum*, Less., var. *globiferum*, Harv.) the heads are 3–3½ lines in diameter, globose, and dark tawny brown in colour.

506. **Athrixia stenophylla,** *Baker* [Compositæ-Inuloideæ]; ad *A. debilem*, DC., madagascariensem magis accedit.

Herba perennis, glabra. *Caules* graciles, stricti, erecti, 2–3-pedales, ad apicem foliati. *Folia* alterna, ascendentia, lineari-subulata, 1–2 poll. longa. *Capitula* homogama, discoidea, pauca, in corymbum terminalem diposita; pedunculi elongati, graciles, foliis paucis reductis præditi. *Involucrum* campanulatum 3 lin. longum, bracteis pauciseriatis lanceolatis glabris squarrosis. *Achænia* angulata, oblonga, glabra, ½ lin. longa. *Pappi* setæ rigidæ, achænio duplo breviores, et paucæ dilatatæ, paleaceæ.

British Central Africa. Nyika plateau, alt. 6000–7000 ft., *Whyte*, 219.

507. **Schistostephium microcephalum,** *Baker* [Compositæ-Anthemideæ]; ad *S. heptalobum*, Benth. et Hook. fil., arcte accedit.

Herba perennis, erecta. *Caules* virgati, albo-pubescentes, ad apicem foliati. *Folia* alterna, simpliciter pinnata, parva, segmentis linearibus planis mucronatis, infimis 6–9 lin. longis, ¾ lin. latis. *Capitula* multa, homogama, discoidea, 2 lin. diam., in corymbum densum terminalem aggregata; pedicelli erecti, albo-pubescentes. *Involucrum* campanulatum, 1½ lin. longum, bracteis lanceolatis inæquilongis appressis albo-pilosis. *Corolla* lutea, ½ lin. longa, lobis parvis ovatis. *Achænia* glabra, angulata, ½ lin. longa.

British Central Africa. Between Kondowe and Karonga, *Whyte*.

508. **Schistostephium artemisiæfolium,** *Baker* [Compositæ-Anthemideæ]; ad *S. heptalobum*, Benth. et Hook. fil., magis accedit.

Herba perennis, erecta. *Caules* albo-pubescentes, ad apicem crebre foliati. *Folia* sessilia, ascendentia, alterna, bipinnatifida, 9–12 lin. longa, segmentis linearibus acutis rigidulis marginibus revolutis facie sparse dorso dense albo-pilosis. *Capitula* homogama, multiflora, 3 lin. diam., in corymbum terminalem disposita, pedicellis pedunculisque dense albo-pilosis. *Involucrum* campanulatum, 1½ lin. longum, bracteis lanceolatis rigidulis appressis inæquilongis albo-pubescentibus. *Corolla* lutea ½ lin. longa, lobis parvis ovatis. *Achænia* glabra, ½ lin. longa.

British Central Africa. Nyika plateau, alt. 6000–7000 ft., *Whyte*, 225.

509. **Senecio (Kleinia) antitensis,** *Baker* [Compositæ—Senecionideæ]; a *S. melastomæfolia*, Baker, recedit pedunculo elongato, capitulis discoideis.

Suffrutex glaberrimus. *Folia* ad apices ramorum conferta, oblonga, subacuta, sessilia, basin versus sensim angustata, 15–18 lin. longa, siccitate rugosa, e basi 5-nervia. *Pedunculi* glabri, graciles, erecti, subpedales. *Capitula* pauca, discoidea, laxe

corymbosa, pedunculis capitulis longioribus erectis. *Involucrum* campanulatum, 3 lin. longum et latum, bracteis circiter 8 oblongo-linearibus obtusis. *Flores* involucro paulo longiores. *Pappus* albus, corollæ tubo æquilongus. *Achænia* matura ignota.

Central Madagascar. Mount Antety, *Forsyth Major*, 678.

510. **Senecio (Kleinia) nyikensis,** *Baker* [Compositæ-Senecionideæ] ; ad *S. longipedem*, Baker, somaliensem magis accedit.

Herba perennis, erecta, subcarnosa, tripedalis. *Caules* validi, glabri, in tertio inferiore crebre foliati. *Folia* producta, oblanceolato-oblonga, integra, subacuta, ad basin longe attenuata, majora 5–6 poll. longa 1 poll. lata ; superiora reducta, remota, parva, linearia. *Capitula* discoidea, homogama, terminalia, pauca, corymbosa ; pedunculi elongati, validi, erecti. *Involucrum* campanulatum, 1 poll. diam., bracteis 13–14 æqualibus (iis, quæ parvae basales in speciebus hujus generis excitari solent, nullo modo excitatis) lanceolatis subcoriaceis glabris. *Corolla* lutea, 6 lin. longa. *Achænia* cylindrica, glabra, 2 lin. longa. *Pappus* albus, mollis, 6 lin. longus.

British Central Africa. Nyika plateau, alt. 6000–7000 ft., *Whyte.*

511. **Dicoma nyikensis,** *Baker* [Compositæ-Mutisiaceæ] ; ad *D. anomalam*, Sond., et *D. quinquenerviam*, Baker, accedit.

Herba perennis, subpedalis, erecta. *Caules* simplices, graciles, albo-incani, ad apicem foliati. *Folia* alterna, sessilia, erecto-patentia, linearia, integra, 2–3 poll. longa, facie viridia glabra, dorso albo-incana. *Capitula* 1–3, terminalia, homogama, discoidea. *Involucrum* campanulatum, 9-12 lin. diam., bracteis multiseriatis appressis pubescentibus, interioribus lineari-subulatis, exterioribus sensim brevioribus lanceolatis. *Corolla* 5 lin. longa, lobis linearibus. *Achænia* angulata, pilis albis ascendentibus dense villosa. *Pappus* albidus, setosus, rigidulus, 4 lin. longus.

British Central Africa. Nyika plateau, alt. 6000–7000 ft., *Whyte.*

512. **Dicoma megacephala,** *Baker* [Compositæ-Mutisiaceæ] ; ad *D. nyikensem*, Baker, arcte accedit.

Herba perennis. *Caules* decumbentes, graciles, subpedales, sæpissime simplices, superne albo-incani, ad apicem foliati. *Folia* sessilia, linearia, integra, 2–3 poll. longa, facie viridia glabra, dorso albo-incana. *Capitula* terminalia, sæpissime solitaria, homogama, tubulosa, 12–18 lin. diam. *Involucrum* campanulatum, multiseriale, 15–18 lin. longum, bracteis rigidulis appressis imbricatis leviter albo-araneosis, interioribus linearibus, exterioribus lanceolatis. *Corolla* 6 lin. longa, cylindrica, lobis linearibus. *Achænia* angulata, pilis albis ascendentibus dense villosa. *Pappus* albus, setosus, rigidulus, 6 lin. longus.

British Central Africa. Between Kondowe and Karonga, alt. 2000–6000 ft., *Whyte.*

513. **Blæria microdonta,** *C. H. Wright* [Ericaceæ]; fruticosa, foliis oblongis glabris minute dentatis, sepalo uno (postico?) cæteris multo longiore.

Frutex ericoideus. *Rami* primum cinereo-tomentosi. *Folia* 1–1½ lin. longa, oblonga, glabra, minute dentata, subtus unisulcata, supra costa elevata, petiolis ½ lin. longis. *Inflorescentia* terminalis, (ebracteata?), floribus tetrameris circa 12 umbellatim dispositis, brevissime pedicellatis. *Sepala* libera, unum cæteris multo longius bracteolum simulans. *Corolla* suburceolata, 1 lin. longa, lobis late triangularibus. *Stamina* subexserta; antheræ bilobatæ, apice magniporosæ, basi aristatæ. *Ovarium* quadriloculare, multiovulatum; stylus quam corolla duplo longior, stigmate subpeltato.

British Central Africa. Mount Mlanje, 6000 ft. *McClounie*, 55, 75, 95.

The absence of glandular hairs on the leaves gives this species a very characteristic appearance. One of the four sepals greatly exceeds the others in size, and at first sight gives the flower the appearance of being unibracteolate. The odd sepal is often green and leaf-like and as long as the corolla.

514. **Oncinotis Batesii,** *Stapf* [Apocynaceæ]; proxima *O. nitidæ*, Benth., sed petiolis longis, foliis majoribus, nervatione minus conspicua, floribus paulo majoribus distincta.

Scandens, inflorescentiis exceptis glabra. *Rami* teretes, fusci. *Folia* oblonga, acuminata, basi acuta, 3½–4½ poll. longa, 1½–2 poll. lata, coriacea, utrinque nitidula, nervis utrinque 12 rectis submargine arcuatim connexis prominentibus, venis prominulis; petiolus longus. *Paniculæ* vel racemi terminales vel subterminales, 2–4 poll. longi, minute rufo-tomentelli; bracteæ mox deciduæ; pedicelli 1–1½ lin. longi. *Calycis* segmenta ovato-elliptica vel elliptica, 1½ lin. longa, in dorso minute rufo-tomentella, dense ciliata. *Corolla* viridi-lutea; tubus intus dense albo-villosus, 2 lin. longus; lobi tubo æquilongi, subobtusi; squamæ fauciales lineares.

Upper Guinea. Cameroons, Efulen, *Bates*, 403.

515. **Cynanchum cucullatum,** *N. E. Brown* [Asclepiadeæ]; species gracilis, corollæ lobis cucullatis et corona reducta facile distinguitur.

Caules 1–2 ped. longi, graciles simplices vel basi ramosi, volubiles, glabri. *Folia* 1¾–3¾ poll. longa, ¾–1½ lin. lata, linearia, acuta, basi in petiolos 1–2½ lin. longos attenuata, plana nisi quod margines angustissime revolutæ sunt, glabra. *Cymæ* umbelliformes, ad nodos laterales, pedunculatæ, 6–12-floræ. *Pedunculi* 3–6 lin. longi, et pedicelli 2–2½ lin. longi, utrique unifariam puberuli; bracteæ ¾ lin. longæ, lanceolato-subulatæ, glabræ. *Sepala* lanceolata, acuta, glabra. *Corolla* profunde 5-loba, 3 lin. diam., lobis 1¼–1¾ lin. longis ¾ lin. latis erecto-patentibus cucullatis apice incurvis acutis glabris. *Corona* subsimplex, breviter cupuliformis, pentagona, levissime 5-loba, ⅓ lin. alta, lobis erectis obtusis antheris

appressis nec adnatis. *Antheræ* erectæ, appendicibus membranaceis ovatis subacutis supra styli apicem convexum inflexis. *Pollinis* massæ pendulæ.

MADAGASCAR. Without locality, *Baron*, 2036.

The very reduced corona of this species slightly resembles that of *C. sarcostemmatoides*, K. Schum.

516. **Cynanchum longipes**, *N. E. Brown* [Asclepiadeæ]; *C. polyantho*, K. Schum., affinis sed petiolis duplo longioribus et coronæ lobis incurvis facile distincta.

Caules volubiles, unifariam puberuli. *Folia* distantia; petiolus 3–3½ poll. longus, gracilis, minute puberulus; lamina 2–3 poll. longa, 1¼–2 poll. lata, late ovata, breviter acuminata, basi cordata, venis minute puberulis. *Cymæ* umbelliformes, laxæ, 5–12-floræ, pedunculatæ; pedunculi 2–6 lin. longi, unifariam puberuli; pedicelli ½–1 poll. longi, subfiliformes, puberuli. *Sepala* ¾ lin. longa, ⅓–½ lin. lata, oblonga, acuta, glabra. *Corollæ* lobi 2½ lin. longi, ¾ lin. lati, oblongi, obtusi, apiculati, utrinque glabri. *Corona* 2 lin. longa, quam columna staminum duplo longior, tubulosa, 10-dentata, intus nuda, dentibus alternis majoribus apice plus minusve bifidis vel inæqualiter bidentatis, omnibus inarcuatis. *Antheræ* subsessiles, subquadratæ, appendicibus ovatis acutis supra apicem styli inflexis.

UPPER GUINEA. Lagos; Papalayito, *Millen* (1895 collection), 48.

517. **Cynanchum lineare**, *N. E. Brown* [Asclepiadeæ]; *C. sibirico*, R. Br., similis, sed corona urceolata differt.

Caules 9–12 poll. alti, erecti vel apice subvolubiles, simplices vel pauciramosi, bifariam pubescentes. *Folia* patentia, subsessilia, 1½–3 poll. longa, ⅓–1 lin. lata, linearia, acuta, plana vel marginibus angustissime revoluta, fere glabra, in costis marginibusque pilis paucis aspersa. *Cymæ* umbelliformes, ad nodos laterales, pedunculatæ, 10–20-floræ; pedunculi 6–9 lin. longi, pedicelli 1½–2¾ lin. longi, utrique pilis curvatis minute pubescentes. *Sepala* ⅔–¾ lin. longa, ⅓ lin. lata, ovata, acuta, subglabra vel parce pubescentia. *Corolla* usque ad ¾ quinqueloba, lobis 1–1¼ lin. longis ½ lin. latis lanceolato-oblongis obtusis glabris. *Corona* ¾ lin. longa, urceolata, plicato-pentagona, ore contracto, 5-dentata, intus nuda, dentibus ovatis obtusis cucullatis. *Staminum* columna quam corona duplo brevior, antheræ sessiles, deltoideæ, crassæ, appendicibus membranaceis anguste lanceolatis inflexis.

MADAGASCAR. Without locality, *Baron*, 109.

518. **Ceropegia fusiformis**, *N. E. Brown* [Asclepiadeæ]; ab omnibus speciebus Africæ tropicæ tubo corollæ ad partem mediam fusiformi-inflato differt.

Caulis volubilis, glaber. *Foliorum* petioli 6–8 lin. longi; laminæ 1¼–2½ poll. longæ, ¾–1¼ poll. latæ, ovatæ vel elliptico-oblongæ, acutæ vel breviter acuminatæ, apiculatæ, basi cuneato-angustatæ, glabræ, marginibus parce et minute ciliolatæ. *Inflorescentia* subumbellatim 6–10-flora; pedunculi 1-1¾ poll. longi, laterales, glabri; pedicelli glabri, 3–4 lin. longi. *Sepala*

2 lin. longa, elongato-ovata, in subulam complicatam attenuata. *Corollæ* tubus $1\frac{1}{2}$ poll. longus, curvatus, basi ovoideo-inflatus, 2 lin. diam., ad partem mediam fusiformi-inflatus 3 lin. diam., extus glaber, intus parte inferiore hirtus; lobi 4–$4\frac{1}{2}$ lin. longi, late deltoidei, apice connati, valde replicati, glabri. *Coronæ* lobi exteriores $\frac{1}{2}$ lin. longi, $\frac{3}{4}$ lin. lati, late ovato-deltoidei, apice minute bifidi vel emarginati, intus hirti; lobi interiores $1\frac{1}{3}$ lin. longi, erecto-conniventes, quam columna staminum multo longiores, oblongo-lineares, basi angustati, dorso hirti.

UPPER GUINEA. Lagos; Abeokuta, *Millen* (1895 collection), 89.

519. **Belmontia divaricata**, *Baker* [Gentianaceæ]; a *B. emirnensi*, Baker, recedit foliis ovatis, ramis paniculæ divaricatis flexuosis.

Herba perennis, glabra. *Caules* acute tetragoni. *Folia* caulina ovata, acuta, sessilia, opposita, 2-$2\frac{1}{2}$ poll. longa, e basi trinervia. *Panicula* ampla, bifurcata, ramis cymosis longe pedunculatis, pedicellis elongatis. *Sepala* cuspidata, 4 lin. longa, dorso late alata. *Corollæ* tubus ampullæformis, calyci subæquilongus; limbus expansus 12–15 lin. diam, lobis obovatis acutis patulis. *Antheræ* lineari-oblongæ, 2 lin. longæ, e tubo corollæ breviter protrusæ, filamentis brevibus filiformibus. *Stylus* filiformis, stigmate capitato.

MADAGASCAR. Forest of Isohimanitra, province of Tanala, *Forsyth Major*.

This is much the finest and most floriferous species of the genus.

520. **Tachiadenus parviflorus**, *Baker* [Gentianaceæ]; a speciebus reliquis recedit floribus parvis.

Herba perennis, glabra, radice lignosa. *Caules* graciles, tetragoni, cæspitosi, 6–9 poll. longi. *Folia* opposita, brevissime petiolata, oblongo-lanceolata, acuta, 5–6 lin. longa, $1\frac{1}{2}$–2 lin. lata, firmula, glabra, basi cuneata. *Flores* solitarii, axillares, pedicellis ascendentibus. *Calyx* $1\frac{1}{2}$ lin. longus, tubo brevissimo, lobis lanceolatis acuminatis. *Corollæ* tubus cylindricus, apice dilatatus, 8–9 lin. longus; lobi albi, patuli, rotundati, cuspidati, 5–6 lin. longi. *Genitalia* in corollæ tubo inclusa. *Fructus* ignotus.

MADAGASCAR. Ambohimitombo, province of Tanala, *Forsyth Major*, 403.

521. **Swertia nummularifolia**, *Baker* [Gentianaceæ]; a *S. pumila*, Hochst., recedit foliis caulinis 4–5 jugis, cymis condensatis paucifloris.

Herba perennis, glabra. *Caules* erecti, 4–6 poll. longi, simplices vel profunde furcati, graciles, tetragoni. *Folia* basalia rosulata, caulina 4–5-juga, orbicularia, sessilia, obtusa, basi rotundata, firmula, viridia, 3–4 lin. longa et lata. *Cymæ* pauciflοræ, condensatæ, terminales. *Sepala* oblonga, obtusa, herbacea, viridia, 2 lin. longa. *Corollæ* tubus campanulatus, calyci æquilongus; lobi obovati, obtusi, lutei, purpureo tincti, tubo paulo longiores. *Antheræ* e corollæ tubo protrusæ, lobis triplo breviores.

MADAGASCAR. Mount Antety, above Ambositra, *Forsyth Major*, 641.

Adds this genus to the flora of Madagascar. There are several species on the mountains of Tropical Africa.

522. **Solanum nakurense**, *C. H. Wright* [Solanaceæ]; fruticosum, ramis glabris, foliis parvis oblongis leviter sinuatis, antheris demum rimis dehiscentibus.

Frutex 3-pedalis. *Rami* tenues, glabri. *Folia* 8 lin. longa, 3 lin. lata, approximata, breviter petiolata, oblonga, leviter sinuata, utrinque pilis paucis simplicibus vestita. *Cymæ* subumbellatæ, prope ramorum apices productæ, pedicellis incrassatis. *Calyx* 2 lin. diam.; lobi anguste triangulares, tubo æquilongi, subglabri. *Corolla* rotata (alba?), 5 lin. diam.; lobi 5, angusti, acuti, subtus pubescentes. *Antheræ* subsessiles, oblongæ, primum poris magnis terminalibus demum rimis longitudinalibus dehiscentes. *Ovarium* oblongum, glabrum; stylus quam stamina duplo longior.

BRITISH EAST AFRICA. Nakuru, *Scott Elliott*, 6800.

Allied to *S. carense*, Dun., but much smaller in all its parts and having perfectly glabrous branches.

523. **Ipomœa operosa**, *C. H. Wright* [Convolvulaceæ]; scandens *I. involucratæ*, Beauv., proxima, sed dense tomentosa, bracteis cymbiformibus subtus longe pilosis differt.

Suffrutex scandens, dense tomentosus. *Folia* cordata, acuta, supra pilis appressis vestita, subtus dense tomentosa, 4–5 poll. longa, 3–4 poll. lata, petiolis 2–3 poll. longis. *Flores* capitati; pedunculi 2½ poll. longi; bracteæ cymbiformes, acutæ, subtus pilis longis præsertim ad basin vestitæ. *Calycis* lobi subulati, quam tubus paulo longiores, ad apicem dense pilosi. *Corolla* campanulata, 1½ poll. longa, 1¼ poll. diam., quam calyx 4-plo longior. *Stamina* quam corolla dimidio breviora.

BRITISH CENTRAL AFRICA. Zomba, *Kirk*, *Whyte;* Nyasaland, *Buchanan* (1891 collection), 370.

Mr. A. Whyte states that "this plant is a most troublesome weed, with a long spongy tap root, most difficult to eradicate from Zomba gardens."

524. **Tecoma Whytei**, *C. H. Wright* [Bignoniaceæ]; fruticosa, foliolis late lanceolatis acutis basi rotundatis obscure crenatis.

Folia pinnatim 4–5-juga; foliola breviter petiolata, subtus ad nervorum axillas pilosa, 1 poll. longa, 7 lin. lata. *Racemi* terminales, bracteolis subulatis; pedunculi 5 poll. longi; pedicelli 5 lin. longi. *Calyx* campanulatus, 6 lin. longus, dentibus 5 late triangularibus acutis. *Corollæ* tubus 1¼ poll. longus, curvatus, superne dilatatus; lobi 6 lin. longi, oblongi, apice rotundati, 2 superiores erecti, 3 inferiores patentes. *Stamina* lobis superioribus corollæ æquilonga; filamenta interne pilosa. *Ovarium* parvum, oblongum.

BRITISH CENTRAL AFRICA. Zomba Plateau, 5000 ft., *Whyte.*

The flowers of this species resemble those of *T. Nyassæ*, Oliv., but the shape of the leaflets is quite different.

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525. **Plantago tanalensis,** *Baker* [Plantagineæ]; a *P. palmata*, Hook. fil., recedit foliis subintegris breviter petiolatis, spicis laxis.

Herba perennis, fibris radicalibus multis gracilibus. *Folia* 8–10, rosulata, breviter petiolata, subrotunda, obtusa, $1\frac{1}{2}$–2 poll. longa, utrinque pubescentia, siccitate rufescentia, e basi quinquenervia. *Pedunculi* graciles, glabri, 6–9 poll. longi. *Spicæ* cylindricæ, interdum 8–9 poll. longæ, sursum densifloræ, deorsum laxifloræ; bracteæ $\frac{3}{4}$ lin. longæ, sepalis consimiles. *Sepala* oblonga, obtusa, 1 lin. longa, glabra, medio brunnea, marginibus late albida. *Corollæ* lobi parvi, oblongi, scariosi, patuli. *Stylus* $\frac{1}{2}$ lin. longus. *Capsula* oblonga, glabra, disperma.

MADAGASCAR. Mount Antety and Ambohimitombo forest, province of Tanala, alt. 1450–1560 ft., *Forsyth Major*, 380, 633, 708; Betsileo-land, *Hildebrandt*, 3906.

There are very few species of *Plantago* in Madagascar and tropical Africa. *P. palmata*, to which this is nearly allied, is a mountain species common to both sides of the continent.

526. **Celosia pandurata,** *Baker* [Amarantaceæ]; ad *C. argenteam*, Linn., arcte accedit.

Herba erecta. *Caules* ramosi, pubescentes. *Folia* petiolata, panduriformia, inferiora 3–4 poll. longa, lobis basalibus magnis ovatis vel oblongis obtusis. *Spicæ* densæ, breves, simplices, terminales; bracteæ ovatæ, acutæ, albæ, floribus breviores. *Perianthium* 2–$2\frac{1}{2}$ lin. longum, segmentis oblongo-lanceolatis acutis, albis, carina concolore trinervata. *Ovarium* ampullæforme, in stylum longum sensim attenuatum, stigmate minuto.

PORTUGUESE EAST AFRICA. Zambesi valley, between Tette and the coast, *Kirk*.

527. **Celosia cuneifolia,** *Baker* [Amarantaceæ]; floribus magnis et stylo elongato *C. argenteæ*, Linn., proximata, recedit habitu suffruticoso.

Suffrutex sarmentosus. *Ramuli* graciles, elongati, sursum pubescentes. *Folia* parva, petiolata, oblonga, acuta, obscure pubescentia, ad basin angustata. *Cymæ* in spicas oblongas terminales aggregatæ; bracteæ minutæ. *Perianthium* album, 2 lin. longum, segmentis oblongis 2 lin. longis, carina concolore trinervata. *Ovarium* ampullæforme; stylus 2 lin. longus. *Utriculus* viridis, perianthio valde brevior.

PORTUGESE EAST AFRICA. Lower part of the valley of the Shire, *Meller*; Moramballa and Shupanga, *Kirk*.

528. **Celosia chenopodiifolia,** *Baker* [Amarantaceæ]; ad *C. trigynam*, Linn., accedit; recedit floribus duplo minoribus, fructu e perianthio exserto.

Caules gracillimi, straminei, glabri. *Folia* perparva, oblonga, integra, ad basin attenuata. *Cymæ* paucifloræ, in spicas terminales elongatas sursum densas aggregatæ. *Perianthium* album,

$\frac{3}{4}$ lin. longum, segmentis oblongis obtusis viridi-carinatis. *Utriculus* viridis, globosus, e perianthio exsertus; stylus brevissimus.

ANGOLA. Chella mountains, *Sir H. H. Johnston.*

529. **Celosia semperflorens,** *Baker* [Amarantaceæ] ad *C. trigynam*, Linn., accedit; recedit spicis densis, floribus duplo minoribus et stylis duobus.

Herba, caulibus erectis ramosissimis glabris. *Folia* petiolata, oblonga vel ovato-lanceolata, integra, basi cuneata, glabra, viridia vel sanguinea, inferiora 2 poll. longa. *Spicæ* breves, densæ, simplices vel basi compositæ; bracteæ ovatæ, minutæ. *Perianthium* album, $\frac{3}{4}$ lin. longum, segmentis oblongis obtusis haud viridi-carinatis. *Utriculus* globosus, perianthio æquilongus; styli 2, brevissimi.

BRITISH CENTRAL AFRICA. Abundant at Blantyre, flowering nearly all the year, *Buchanan* (1881 collection), 52.

530. **Celosia minutiflora,** *Baker* [Amarantaceæ]; ad *C. semperflorentem*, Baker, (vide supra) accedit; recedit spicis laxis, fructu exserto.

Caules graciles, elongati, glabri, parum ramosi. *Folia* perparva, oblonga, subsessilia, basi angustata vel rotundata. *Cymæ* pauciflora, in glomerulos globosos congestæ, glomerulis in spicis elongatis laxis dispositis; bracteæ ovatæ, minutæ. *Perianthium* album, $\frac{3}{4}$ lin. longum, segmentis oblongis obtusis haud viridi-carinatis. *Utriculus* globosus, viridis, e perianthio exsertus; styli 2, brevissimi.

UGANDA. *Hannington.*

531. **Celosia loandensis,** *Baker* [Amarantaceæ]; ad *C. trigynam*, Linn, accedit; recedit habitu suffruticoso, floribus minoribus, stylis 2, fructo exserto.

Suffrutex, ramis elongatis. *Ramuli* multi, breves, patuli, glabri. *Folia*, petiolata, ovata, acuminata, glabra, basi cordata. *Cymæ* in glomerulos globosos congestæ, glomerulis in spicis brevibus terminalibus interruptis dispositis; bracteæ ovatæ, perianthio breviores. *Perianthium* album, 1 lin. longum, segmentis ovato-oblongis; carina viridi-brunnea. *Utriculus* globosus, e perianthio exsertus; styli 2, brevissimi.

WEST TROPICAL AFRICA. Angola; province of Loanda, under 1000 ft., *Welwitsch*, 6537 b. Lower Congo, *C. Smith.*

532. **Celosia nana,** *Baker* [Amarantaceæ]; annua, stigmatibus 2 sessilibus.

Herba annua, glabra, ramosissima. *Ramuli* 3–4 poll. longi. *Folia* perparva, oblonga, subsessilia, ad basin angustata. *Cymæ* laxæ, in paniculas terminales interruptas aggregatæ; bracteæ ovatæ, minutæ. *Perianthium* album, $\frac{3}{4}$ lin. longum, segmentis oblongis obtusis obscure carinatis. *Utriculus* globosus, perianthio æquilongus.

ANGOLA. *Welwitsch*, 6566.

533. **Hermstædtia Welwitschii**, *Baker* [Amarantaceæ]; ad *H. linearem*, Schinz, arcte accedit; recedit floribus majoribus lobisque staminiferis longioribus tricuspidatis.

Herba perennis glabra. *Caules* graciles, virides. *Folia* sparsa, sessilia, linearia, 1–2 poll. longa. *Spicæ* densæ, simplices, 1–4 poll. longæ; bracteæ ovatæ vel ovato-lanceolatæ, perianthio valde breviores. *Perianthium* niveum, 3 lin. longum, segmentis ovato-oblongis acutis dorso distincte trinervatis. *Cupula staminifera* brevis, lobis elongato-quadratis tricuspidatis.

PORTUGUESE WEST AFRICA. Province of Mossamedes, *Welwitsch*, 6502.

534. **Sericocoma Welwitschii**, *Baker* [Amarantaceæ]; ovario oblongo haud cornuto, foliis oblongis membranaceis.

Herba perennis. *Ramuli* oppositi, pubescentes. *Folia* breviter petiolata, opposita, oblonga, 12–18 lin. longa, utrinque pilosa. *Glomeruli* axillares et in paniculam oblongam terminalem aggregati; flores steriles spinosi, straminei; bracteæ ovatæ, perianthio valde breviores. *Perianthium* 2 lin. longum, basi lanosum, segmentis rigidis lanceolatis viridibus albo-marginatis. *Staminodia* quadrata. *Ovarium* oblongum; stylus elongatus, stigmate capitato.

PORTUGUESE WEST AFRICA. Province of Mossamedes, *Welwitsch*, 6501.

535. **Cyathula Mannii**, *Baker* [Amarantaceæ]; ad *C. cylindricam*, Moq., et *C. Schimperianam*, Moq., arcte accedit.

Herba perennis, ramosa, 6–10 pedalis. *Ramuli* sursum pilis reflexis vestiti. *Folia* breviter petiolata, ovata vel oblonga, acuta, utrinque dense pilosa, inferiora 2–3 poll. longa. *Glomeruli* in spicas oblongas terminales aggregati, supremis exceptis reflexi; florium sterilium spinæ floribus fertilibus longiores, apice hamatæ; bracteæ scariosæ, ovatæ, acuminatæ, albidæ. *Perianthium* album, 2 lin. longum, segmentis oblongo-lanceolatis pilosis.

TROPICAL AFRICA. Cameroon mountains, alt. 7000 ft., and Fernando Po, alt. 10000 ft., *Mann*; Ruwenzori, alt. 6000–8000 ft., *Scott Elliot*, 7702.

I believe this to be distinct from both the above-mentioned nearly allied eastern species.

536. **Cyathula polycephala**, *Baker* [Amarantaceæ]; ad *C. globuliferam*, Moq., accedit.

Herba perennis. *Ramuli* dense pilosi. *Folia* breviter petiolata, oblonga, acuta, utrinque dense pilosa. *Glomeruli* in capitula globosa 1 poll. diam. aggregati; capitula 10–15, in paniculas spicatas terminales disposita; bracteæ ovatæ, scariosæ, albæ, floribus breviores. *Perianthium* album, 3 lin. longum, segmentis lanceolatis acuminatis scariosis. *Spinæ* hamatæ, perianthio æquilongæ.

BRITISH EAST AFRICA. Kapti plateau, Masai-land, alt. 5000–6000 ft., *Joseph Thomson*.

537. **Psilotrichum concinnum,** *Baker* [Amarantaceæ] ; a *P. africano*, Oliv., recedit, habitu herbaceo, foliis multo minoribus, spicis omnibus terminalibus.

Herba perennis, ramosa. *Ramuli* glabri, graciles, pallide virides. *Folia* parva, breviter petiolata, oblonga, acuta vel obtusa, sparse pubescentia. *Spicæ* parvæ, densæ, oblongæ, omnes terminales, rhachi subrecto dense piloso ; bracteæ parvæ, late ovatæ. *Perianthium* album, 2 lin. longum, segmentis oblongo-lanceolatis rigidis pubescentibus. *Staminodia* abortiva. *Stylus* brevissimus, stigmate capitato.

BRITISH CENTRAL AFRICA. Blantyre, *Last.*

538. **Psilotrichum trichophyllum,** *Baker* [Amarantaceæ] ; a *P. africano*, Oliv., recedit foliis firmis subsessilibus utrinque dense pubescentibus.

Suffrutex, ramulis lignosis dense pubescentibus. *Folia* subsessilia, oblonga, $1\frac{1}{4}$–2 poll. longa, acuta, firmula, utrinque dense pubescentia. *Spicæ* densæ, pauciforæ, in paniculam parvam terminalem dispositæ. *Perianthium* album, 2 lin. longum, segmentis oblongo-lanceolatis rigidis pubescentibus.

PORTUGUESE EAST AFRICA. Lower part of the Zambesi valley at Shamo, *Kirk.*

539. **Psilotrichum debile,** *Baker* [Amarantaceæ] ; a *P. africano* Oliv., recedit foliis obovatis subsessilibus, ramulis elongatis debilibus.

Herba perennis. *Ramuli* elongati, debiles, pubescentes. *Folia* subsessilia, obovato-cuneata, circiter 1 poll. longa, obtusa, minute mucronata, utrinque pubescentia. *Spicæ* terminales, densæ, oblongæ, 1 poll. longæ, rhachi subrecto dense piloso ; bracteæ ovatæ, pubescentes, floribus paulo breviores. *Perianthium* album, $2\frac{1}{2}$ lin. longum, segmentis oblongo-lanceolatis rigidis dense pubescentibus. *Staminodia* quadrata, pilosa. *Stylus* elongatus, stigmate capitato.

ANGOLA. *Welwitsch*, 6570.

540. **Psilotrichum rubellum,** *Baker* [Amarantaceæ] ; a *P. schimperiano*, Engl., recedit rhachibus spicarum lanosis.

Herba perennis, erecta. *Caules* graciles, sulcati, sparse pubescentes. *Folia* fasciculata, sessilia, linearia, plana, 1–2 poll. longa, viridia, subglabra. *Spicæ* parvæ, densæ, terminales, rhachibus lanosis ; bracteæ ovatæ, parvæ. *Perianthium* rubrum, glabrum, 2 lin. longum ; segmentis rigidis oblongo-lanceolatis. *Staminodia* quadrata. *Stylus* elongatus, stigmate capitato.

ANGOLA. Province of Huilla, alt. 3800–5500 ft., *Welwitsch*, 6509. Province of Humpata, Chella mountains, *Sir H. H. Johnston.*

541. **Psilostachys Kirkii,** *Baker* [Amarantaceæ] ; ad *P. gnaphalobryam*, Hochst., (Psilotrichum cordatum, *Moq.*) accedit.

Suffrutex erecta. *Ramuli* lignosi, teretes, glabri. *Folia*

petiolata, cordato-ovata, 1 poll. longa, acuta, dorso dense pubescentia. *Panicula* ampla, laxa, ramis ascendentibus, ramulis capillaribus flexuosis, spicis paucifloris. *Perianthium* viride, pilosum, 1½ lin. longum, segmentis exterioribus oblongo-lanceolatis rigidis dorso distincte trinervatis.

BRITISH EAST AFRICA. Sabaki River, Melinda, near Mombasa, *Kirk.*

542. **Achyranthes breviflora,** *Baker* [Amarantaceæ] ; ad *A. oblanceolatam*, Schinz, et *A. Carsoni*, Baker, magis accedit.

Herba perennis. *Caules* graciles, virgati, glabri, albidi, viridistriati, angulati. *Folia* petiolata, linearia, integra, glabra, ad basin attenuata. *Spicæ* densæ, primum oblongæ, demum cylindricæ, 2–3 poll. longæ ; bracteæ lanceolatæ, scariosæ, deflexæ, glabræ, 1½ lin. longæ ; bracteolæ ovatæ, ascendentes, perianthio duplo breviores. *Perianthii* segmenta rigida, lanceolata, glabra, 2 lin. longa, medio viridia, marginibus pallide rubra. *Stamina* peranthio paulo breviora. *Ovarium* ovoideum ; stylus elongatus.

BRITISH CENTRAL AFRICA. Between Kondowe and Karonga, alt. 2000–6000 ft., *Whyte.*

543. **Achyranthes Carsoni,** *Baker* [Amarantaceæ]; ad *A. oblanceolatam*, Schinz, arcte accedit.

Herba perennis, pedalis. *Caules* simplices vel furcati, erecti ad nodos solum pilosi. *Folia* paucijuga, sessilia, lanceolata vel oblanceolata, subcoriacea, viridia, glabra, centralia 1–2 poll. longa 3–4 lin. lata. *Spicæ* simplices, densifloræ, terminales, longe pedunculatæ, 1–3 poll. longæ, floribus inferioribus patulis haud reflexis ; bracteæ parvæ, ovatæ, acutæ, albæ. *Perianthium* album, glabrum, 3 lin. longum, segmentis rigidis lanceolatis, carina distincte trinervata. *Stamina* perianthio multo breviora. *Stylus* elongatus, stigmate capitato.

BRITISH CENTRAL AFRICA. Fwambo, Lake Tanganyika, alt. 5000–6000 ft., *Carson* (1893 collection), 8.

544. **Polygonum (Persicaria) nyikense,** *Baker* [Polygonaceæ] ; ad *P. Poiretii*, Meissn., accedit ; recedit spicis cylindricis, in paniculam brevem aggregatis.

Caulis ramosus, modice robustus, glaber. *Folia* lanceolata, 3–4 poll. longa, utrinque setis sparsis appressis vestita ; ochreæ magnæ, ad apicem appressæ, dorso pilis sparsis munitæ, margine setis densis ciliatæ. *Spicæ* subdensæ, 1–2 poll. longæ, 8–10, in paniculam brevem aggregatæ ; bracteæ superiores glabræ, inferiores margine setis ciliatæ. *Perianthium* 1½ lin. longum, segmentis oblongis rubro-viridibus haud glanduloso-punctatis. *Nux* lenticularis, orbicularis, castaneus, nitidus ; styli 2.

BRITISH CENTRAL AFRICA. Nyika mountains, 4000–6000 ft., *Whyte.*

545. **Pilea floribunda,** *Baker* [Urticaceæ-Urticeæ] ; a speciebus omnibus africanis facile distinguitur foliis magnis breviter petiolatis cymis in paniculam laxam dispositis.

Caules sublignosi, pubescentes. *Folia* oblonga, acuta, breviter petiolata, 8–9 poll. longa, medio $2\frac{1}{2}$–3 poll. lata, ad basin sensim angustata, obscure crenata, facie glabrata, dorso pubescentia, e basi ad medium triplinervia. *Paniculæ* axillares, monoicæ, foliis paulo breviores, ramis pubescentibus patulis vel reflexis, cymis ad apices ramulorum congestis. *Perianthii* segmenta ovata, acuta, pubescentia, $\frac{3}{4}$ lin. longa. *Stamina* perianthio æquilonga. *Flores* feminei et fructus ignoti.

MADAGASCAR. Forest of Ambohimitombo, province of Tanala, alt. 1450–1560 ft., *Forsyth Major*, 270.

546. **Gymnosiphon squamatum**, *C. H. Wright* [Burmanniaceæ]; *G. usambarico*, Engl., proximum, sed perianthii lobis exterioribus integris differt.

Herba debilissima, glabra. *Caulis* ascendens, 3–4 poll. longus. *Folia* ad squamas $\frac{1}{2}$ lin. longas reducta. *Inflorescentia* terminalis, cymosa. *Perianthium* infundibuliforme, 3 lin. longum; lobi exteriores integri, ovati, interiores desunt. *Stamina* perianthii faucibus affixa. *Ovarium* globosum, uniloculare, multiovulatum; stylus perianthii tubo æquilongus, stigmate trilobato. *Capsula* globosa, 2 lin. diam.

WEST TROPICAL AFRICA. Sibange Farm, Gaboon, *Soyaux*, 167, 168; Efulen, Cameroons, *Bates*, 311.

547. **Syringodea luteo-nigra**, *Baker* [Irideæ]; ad *S. bicolorem*, Baker, magis accedit: recedit segmentis perianthii tubo paulo longioribus.

Cormus globosus, 9 lin. diam., tunicis membranaceis brunneis. *Folia* basalia 4–5, teretia, gracilia, rigida, glabra, flore longe superantia, pedalia, $\frac{1}{2}$ lin. diam. *Pedunculus* brevis, strictus, erectus, uniflorus, 2–3 poll. longus; spathæ valvæ 2, lineares, æquilongæ, sursum rigidæ, deorsum membranaceæ. *Perianthii* tubus gracilis, cylindricus, apice dilatatus, 14–15 lin. longus; segmenta oblonga, tubo longiora, aurantiaca, dorso nigrescentia, 15–18 lin. longa. *Genitalia* segmentis distincte breviora.

CAPE COLONY. Queenstown division, on the summit of the Andries Berg, near Baileytown, alt. 6350 ft., and on the Hangklip Mountains, alt. 6600 ft., *Galpin*, 1516.

548. **Aristea nyikensis**, *Baker* [Irideæ]; ad *A. paniculatam*, Pax, (A. Lastii, *Baker*) magis accedit.

Caulis pedalis, applanatus, angustissime alatus, foliis 4–5 remotis præditus. *Folia* linearia, ascendentia, media 8–9 poll. longa 3–4 lin. lata, superiora sensim minora. *Panicula* laxa, thyrsoidea, capitulis florum 3–4 supremis sessilibus; pedunculi florum inferiorum breves, erecto-patentes; pedicelli 2 lin. longi. *Perianthium* ignotum. *Capsula* oblongo-globosa, 3 lin. longa, obtuse angulata, valvis demum torulosis.

BRITISH CENTRAL AFRICA. Nyika plateau, 6000-7000 ft., *Whyte*.

549. **Aristea zombensis**, *Baker* [Irideæ]; ad *A. paniculatam*, Pax, etiam accedit.

Folia radicalia 5–6, linearia, rigidula, pedalia, 3 lin. lata, conspicue nervata, nervis crebris. *Caulis* pedalis, gracilis, angulatus, foliis 3-4 ascendentibus præditus, infimo elongato, reliquis valde reductis. *Capitula* florum superiora sessilia, infimum breviter pedunculatum; bracteæ exteriores magnæ, oblongæ, integræ, marginibus late-membranaceæ. *Perianthium* cæruleum 3 lin. longum, segmentis oblongis. *Capsula* oblonga, parva, subsessilis, obtuse angulata.

British Central Africa. Mount Zomba, alt. 4000–6000 ft., *Whyte.*

550. **Gladiolus (Hebea) stenophyllus**, *Baker* [Irideæ]; a *G. eduli*, Benth., recedit foliis subteretibus staminibus perianthio paulo brevioribus.

Cormus globosus, parvus, tunicis fibrosis supra collum longe productis. *Folia* basalia rigida, subteretia, glabra, facie canaliculata, subpedalia. *Caulis* gracilis, simplex, folio unico reducto vaginante præditus, 6–9 poll. altus. *Spica* simplex, secunda, multiflora, 2–4 poll. longa; spathæ valva exterior parva, oblongo-lanceolata, 3–4 lin. longa. *Perianthium* rubellum, 13–14 lin. longum, tubo brevi anguste infundibulari 5 lin. longo, segmentis superioribus oblongis cuspidatis basi cuneatis, segmentis inferioribus 3 oblanceolatis longe unguiculatis superioribus æquilongis. *Stamina* limbo paulo breviora.

Cape Colony. Queenstown Div.: Hangklip Mountains, alt. 5800 ft., *Galpin*, 1769.

551. **Gladiolus (Eugladiolus) Whytei**, *Baker* [Irideæ]; ad *G. brevifolium*, Jacq., et *G. atropurpureum*, Baker, accedit.

Cormus globosus, 1 poll. diam., tunicis exterioribus fibris robustis parallelis percursis. *Folia* radicalia ad bracteas reducta. *Caulis* gracilis, pedalis, foliis 3–4 rudimentariis apicibus liberis anguste linearibus brevissimis præditus. *Spica* simplex, laxa, secunda, 6-12 poll. longa; spathæ valva exterior viridis, oblongo-navicularis, 6–12 lin. longa. *Perianthium* pollicare; tubus curvatus, infundibularis, 4 lin. longus; segmenta superiora oblonga, obtusa, atro-purpurea, cucullata, basi cuneata; 3 inferiora paulo longiora, alba, limbo parvo medio atro-purpureo, ungue angusto elongato. *Stamina* segmentis superioribus paulo breviora.

British Central Africa. Mount Zomba and Mount Malosa, alt. 4000–6000 ft., *Whyte.*

552. **Gladiolus venulosus**, *Baker* [Irideæ]; ad *G. zanquebaricum*, Baker, (G. Kirkii, *Baker, Handb. Irid. p.* 229) magis accedit.

Cormus ignotus. *Caulis* gracilis, sesquipedalis, foliis 5–6 brevibus deorsum vaginantibus sursum liberis anguste linearibus rigidulis glabris præditus. *Spica* laxa, secunda, 3–6 poll. longa; spathæ valvæ exteriores lanceolatæ, 9–18 lin. longæ, dimidio inferiori scariosæ, acumine herbaceæ. *Perianthium* album, lilacino tinctum et venis pulchre lilacinis percursum; tubus

leviter curvatus, 6 lin. longus; segmenta superiora oblongo-spathulata, haud cucullata, 12–15 lin. longa; inferiora consimilia, vix minora. *Stamina* limbo duplo breviora.

BRITISH CENTRAL AFRICA. Near Fort Hill, Nyasa-Tanganyika plateau, 35000–4000 ft., *Whyte.*

553. **Gladiolus nyikensis,** *Baker* [Irideæ]; ad *G. Grantii*, Baker, magis accedit.

Cormus globosus, parvus. *Caulis* gracilis, pedalis, foliis 6–8 anguste linearibus rigidulis glabris præditus, infimo pedali, superioribus sensim minoribus. *Spica* laxa, secunda, semipedalis; spathæ valvæ exteriores 12–15 lin. longæ, basi ovatæ, scariosæ, acuminibus herbaceæ, virides. *Perianthium* album, plus minusve lilacino tinctum; tubus curvatus, infundibularis, semipollicaris; segmenta superiora oblongo-spathulata, subacuta, haud cucullata, 15 lin. longa; inferiora consimilia, vix minora. *Stamina* limbo triplo breviora.

BRITISH CENTRAL AFRICA. Nyika plateau, alt. 6000–7000 ft., *Whyte.*

554. **Gladiolus (Eugladiolus) Johnstoni,** *Baker* [Irideæ]; ad *G. quartinianum*, A. Rich., magis accedit; recedit floribus minoribus rubris segmentis superioribus minus cucullatis staminibus brevibus.

Folia radicalia lanceolata, rigide coriacea, 12–15 lin. lata, venis marginibusque incrassatis stramineis. *Caulis* simplex, foliis paucis rudimentariis vaginantibus præditus. *Spica* simplex, laxa, secunda, 6–9 poll. longa; spathæ valva exterior viridis 9–15 lin. longa. *Perianthium* rubrum; tubus curvatus, infundibularis, 9 lin. longus; segmenta superiora oblonga, leviter cucullata, 2 poll. longa; segmenta inferiora multo minora. *Stamina* limbo triplo breviora.

BRITISH CENTRAL AFRICA. Mount Zomba and Mount Malosa, alt. 4000–6000 ft., *Whyte.*

A fine plant, which would be well worth introducing into cultivation.

555. **Gladiolus masukuensis,** *Baker* [Irideæ]; ad *G. luridum* Welw., magis accedit.

Folia radicalia linearia, rigida, glabra, sesquipedalia, 3 lin. lata, venis marginibusque incrassatis stramineis. *Caulis* pedalis et ultra, interdum furcatus, foliis paucis productis præditus, infimo elongato. *Spica* laxa, secunda, 6–9 poll. longa; spathæ valvæ exteriores firmulæ, virides, oblongæ vel lanceolatæ, 9–12 lin. longæ. *Perianthium* lilacinum, pollicare, tubo brevi curvato; segmenta superiora oblonga, obtusa, insigniter cucullata; 3 inferiora paulo breviora, limbo parvo atrobrunneo, ungue elongato angusto. *Stamina* limbo paulo breviora.

BRITISH CENTRAL AFRICA. Masuku plateau, alt. 6500–7000 ft., *Whyte.* Described from specimens cultivated in a garden at Zomba.

556. **Hypoxis (Euhypoxis) oligophylla,** *Baker* [Amaryllidaceæ-Hypoxideæ]; gracillima, uniflora, foliis 2–3 lineari-subulatis.

Cormus oblongus, 3–4 lin. diam., tunicis interioribus membranaceis supra collum productis. *Folia* producta 2–3, erecta, lineari-subulata, 2–3 poll. longa, obscure pilosa, uninervata, costa incrassata angulata. *Pedunculus* gracilis, uniflorus, erectus, 1½–2 poll. longus, superne pilosus. *Perianthii* segmenta oblongo-lanceolata, 3 lin. longa, facie flava, dorso viridula, leviter pilosa. *Stamina* perianthio triplo breviora, antheris linearibus luteis, filamentis brevissimis. *Ovarium* clavatum, pilosum, 1½ lin. longum.

MADAGASCAR. Mount Antety, *Forsyth Major*, 669.

Of this very dwarf slender mountain species the nearest ally is the Angolan *H. monanthos*, Baker.

557. **Hypoxis (Euhypoxis) malosana,** *Baker* [Amaryllidaceæ-Hypoxideae]; ad *H. canaliculatam*, Baker, angolensem magis accedit.

Folia basalia scariosa, dense pilosa; cætera producta linearia, erecta, rigidula, parce pilosa, semipedalia, 1 lin. lata. *Pedunculi* 3–4, gracillimi, infra apicem glabri, foliis superantes. *Flores* pauci in racemum brevem aggregati; pedicelli erecti, dense pilosi; bracteæ lineares, parvæ. *Ovarium* turbinatum, dense pilosum. *Perianthii* segmenta lanceolata, dorso dense pilosa. *Stamina* brevissima. *Capsula* medio circumscissa.

BRITISH CENTRAL AFRICA. Mount Malosa, near Zomba, alt. 4000–6000 ft., *Whyte.*

558. **Hypoxis (Euhypoxis) nyasica,** *Baker* [Amaryllidaceæ-Hypoxideae]; ad *H. obtusam*, Burch., magis accedit.

Folia basalia scariosa, glabra; cætera producta, multa, linearia, firmula, pilosa, pedalia, 3 lin. lata. *Pedunculi* interdum 6–7, erecti vel patuli, sparse pilosi, foliis breviores. *Flores* pauci, in racemos laxos aggregati; pedicelli breves, ascendentes, pilosi; bracteæ minutæ, lineares. *Ovarium* turbinatum, pilosum. *Perianthii* segmenta oblonga, flava, 3–4 lin. longa, dorso dense pilosa. *Stamina* limbo duplo breviora, filamentis brevissimis. *Capsula* medio circumscissa.

BRITISH CENTRAL AFRICA. Mount Zomba and Mount Malosa, alt. 4000–6000 ft., *Whyte.*

559. **Crinum (Codonocrinum) parvum,** *Baker* [Amaryllideæ-Amarylleæ]; ex affinitate *C. pauciflori*, Baker.

Bulbus ovoideus, parvus, in collum haud productus. *Folia* 5–7, synanthia, linearia, glabra, flaccida, 6-9 poll. longa, medio 6–7 lin. lata. *Pedunculus* gracilis, uniflorus, foliis æquilongus; spathæ valvæ lanceolatæ. *Perianthium* sessile, tubo cylindrico erecto viridulo 3 poll. longo, segmentis lanceolatis dorso rubro-vittatis 3 poll. longis 6 lin. latis. *Stamina* limbo paulo breviora, antheris 3–4 lin. longis.

EAST TROPICAL AFRICA. Banks of the Zambesi River. Flowered in the garden of W. E. Gumbleton, Esq., of Queenstown, Ireland, in May 1896.

560. **Anthericum (Trachyandra) malosanum,** *Baker* [Liliaceæ-Asphodeleæ]; ad *A. Gerrardi*, Baker, magis accedit.

Folia radicalia multa, anguste linearia, firmula, 6-8 poll. longa, pilis mollibus patentibus parce vestita. *Pedunculus* gracilis, subteres, brevis, simplex vel furcatus, dense vel sparse pilosus. *Racemi* laxissimi, 6–9 poll. longi, pedicellis brevibus solitariis cernuis, apice articulatis; bracteæ minutæ, membranaceæ, acutæ, viridi-carinatæ. *Perianthium* 3 lin. longum, segmentis albidis viridi-carinatis. *Stamina* perianthio paulo breviora, antheris oblongis filamentis paulo brevioribus. *Capsula* globosa, muricata, 2 lin. diam.

BRITISH CENTRAL AFRICA. Mount Malosa, near Zomba, alt. 4000–6000 ft., *Whyte.*

561. **Anthericum (Dilanthes) Whytei,** *Baker* [Liliaceæ-Asphodeleæ]; ab *A. trifloro*, Ait., (A. Cameroni, *Baker*) præsertim recedit foliis pubescentibus.

Folia linearia, chartacea, pedalia, et ultra, 6–9 lin. lata, venis crebris elevatis, utrinque dense persistenter pubescentibus. *Pedunculus* anceps, aphyllus, simplex, pedalis. *Racemus* simplex, brevis, superne densus, pedicellis brevibus medio articulatis, inferioribus 2–3-nis; bracteæ ovatæ, parvæ, imbricatæ, brunneæ. *Perianthium* 3 lin. longum; segmenta oblonga, alba, carinata, carina pallide brunnea. *Stamina* perianthio paulo breviora, antheris linearibus magnis, filamentis brevissimis. *Ovarium* globosum; stylus antheras superans.

BRITISH CENTRAL AFRICA. Mount Zomba, alt. 2500-3500 ft., *Whyte.*

562. **Chlorophytum floribundum,** *Baker* [Liliaceæ-Asphodeleæ]; ad *C. gallabatensem*, Schweinf., magis accedit.

Folia radicalia sessilia, lanceolata, membranacea, glabra, pedalia et ultra, medio 1–2 poll. lata, venis laxis perspicuis. *Racemi* 5, cylindrici, elongati, ascendentes, paniculam amplam formantes; pedicelli 3–4-ni, breves, pubescentes, medio articulati; bracteæ lanceolatæ, inferiores magnæ. *Perianthium* album, oblongum, 3 lin. longum, segmentis lanceolatis obscure carinatis. *Stamina* perianthio paulo breviora, antheris parvis oblongis. *Ovarium* globosum, acute angulatum; stylus elongatus, curvatus.

BRITISH CENTRAL AFRICA. Mount Zomba, alt. 2500–3500 ft., *Whyte.*

563. **Albuca (Falconera) Adlami,** *Baker* [Liliaceæ-Scilleæ]; ad *A. polyphyllam*, Baker, magis accedit.

Bulbus globosus, 2 poll. diam., fibris coronatus. *Folia* 30–40, erecta, subteretia, viridia, pedalia, glabra, facie profunde canaliculata, dorso rotundata. *Pedunculus* validus, semipedalis. *Flores* 5–6, corymbosi; pedicelli erecti, 3–6 poll. longi; bracteæ parvæ, lanceolatæ. *Perianthium* oblongum, segmentis albis læte viridi-vittatis, exterioribus lineari-oblongis 1 poll. longis, interioribus brevioribus apice incurvatis. *Stamina* 6, segmentis

interioribus paulo breviora, antheris omnibus fertilibus, filamentis applanatis. *Stylus* triqueter, trisulcatus, validus, ovario oblongo duplo longior.

TRANSVAAL. *Adlam.* Flowered at Kew, June, 1897.

564. **Albuca (Falconera) nyikensis,** *Baker* [Liliaceæ - Scilleæ]; ad *A caudatam*, Jacq., et *A. fastigiatam*, Dryand., magis accedit.

Bulbus globosus, magnus. *Folia* linearia, glabra, deorsum 9 lin. lata, ad apicem sensim attenuata *Pedunculus* elongatus, validus, teres. *Racemus* laxus, cylindricus, demum pedalis, pedicellis erecto-patentibus, infimis 1½–2 poll. longis; bracteæ lanceolatæ, acuminatæ, pedicellis breviores. *Perianthium* oblongum, 1 poll. longum; segmenta lineari-oblonga, alba, dorso carinata, carina læte viridi multinervata. *Stamina* perianthio paulo breviora, antheris omnibus fertilibus, filamentis linearibus. *Ovarium* oblongum; stylus validus, ovario paulo longior. *Capsula* ovoidea, 9 lin. longa. *Semina* multa, turgida, opaca, brunnea.

BRITISH CENTRAL AFRICA. Nyika plateau, alt. 6000–7000 ft., *Whyte*, 246.

565. **Rhaphidophora africana,** *N. E. Brown* [Aroideæ]; *R. Kunstleri*, Hook. fil., similis, differt venis magis ascendentibus et spatha multo minori.

Caulis alte scandens, 80–100 ped. longus, parte florifera 6 lin. crassus. *Foliorum* petioli 6–10 lin longi; laminæ 8–21 poll. longæ, 2¼–4¾ poll latæ, elongato-oblongo-lanceolatæ, acuminatæ, valde obliquæ vel subfalcatæ, basi cuneato-acutæ, glabræ, venis numerosis parallelis ascendentibus leviter curvatis. *Pedunculi* 3–5 poll. longi, glabri. *Spatha* circa 4–4½ poll. longa, elliptico-oblonga, acuminata, dum convoluta rostrata, glabra, alba. *Spadix* sessilis, 3½–4 poll. longus. *Ovarium* imperfecte 2-loculare, ovulis plurimis.

UPPER GUINEA. Fernando Po, *Mann*, 103. Sierra Leone, near Sakuru, *Scott Elliot*, 4940, and near Kurusu, *Scott Elliot*, 5524. Ashantee, Assin-yan-Coomassie, *Cummins*, 47.

566. **Rhaphidophora pusilla,** *N. E. Brown* [Aroideæ]; species caule tenuissimo et spathis parvis facile distinguitur.

Caulis tenuissimus, ½–1 lin. crassus, radicans, glaber. *Foliorum* petioli 4–4¾ poll. longi; laminæ 5–6½ poll. longæ, 1¼–1¾ poll. latæ, subobliquè lanceolatæ, acuminatæ, basi cuneato-acutæ, utrinque glabræ, venis numerosis parallelis. *Pedunculi* 1¼–2 poll longi, graciles, quam petioli duplo breviores. *Spatha* 7–9 lin. longa, circa 3 lin. diam., dum convoluta cylindrica subulato-rostrata. *Spadix* 4–5½ lin. longus, sessilis. *Ovarium* imperfecte 2-loculare pluriovulatum.

FRENCH CONGO TERRITORY. Gaboon: Sierra del Crystal *Mann*, 1700.

567. **Pennisetum (Beckeropsis) Kirkii,** *Stapf* [Gramineæ-Paniceæ]; *P. uniseto*, Benth., consimillima, sed gluma ii. magis evoluta 3–5-nervi, et glumis iii. et iv. similibus distincta.

Culmi erecti, graciles, ramosi, superne plus minusve triquetri, glabri, leves, multinodi. *Foliorum* vaginæ subarctae, glabræ vel ad nodos parce pilosæ; ligulæ ad pilorum series reductæ; laminæ lineares vel lanceolato-lineares, longe attenuatæ, basi angustæ vel subpetiolatæ, ad 1 ped. longæ, 5 lin. latæ, firmulæ, subglaucæ, scaberulæ vel marginibus exceptis leves. *Racemi* longe tenuiterque pedunculati, solitarii vel geminati, e vaginis superioribus orti, 1–2 poll. longi., rhachi scabrida. *Spiculae* subimbricatae, lanceolato-oblongae, acutae, 1–1½ lin. longae, seta basali circiter 1 poll. longa; gluma i. rotundata, hyalina, enervis, ¼ lin. longa, ii. ovata vel oblongo-lanceolata, acuta vel acuminata, tenuiter 3–5-nervis, minute scaberula spiculam æquans vel dimidio brevior; cætera ut in *P. uniseto*.

BRITISH CENTRAL AFRICA. Shire Highlands, Soche Hill, 3000 ft., *Kirk*.

568. **Andropogon (Sorghum) trichopus**, *Stapf* [Gramineæ-Andropogoneæ] *A. bipennato*, Hack., affinis, sed paniculae ramulis sub spiculis ciliatis et arista brevi 4 lin. longa distincta.

Culmi 4–5 ped. alti, graciles. *Foliorum* vaginae superiores longissimæ, glabræ, leves; ligulæ pubescentes; laminæ subsetaceo-convolutæ, glabræ, leves, summæ 4–6 poll. longæ. *Panicula* erecta, lineari-oblonga, 6–10 poll. longa; rami primarii ad 4 poll. longi, 6-articulati, secundarii ramulosi, flexuosi, patuli vel demum erecti, filiformes vel capillares; ramuli ultimæ ordinis sub spiculis ciliati; articuli eleganter ciliati. *Spiculæ* solitariæ, lanceolatæ vel lanceolato-oblongæ, 2–2½ lin. longæ, pallidæ; gluma i. truncata, sub apice hyalino albo-pilosa, tenuiter 8–9-nervis; ii. glabra, apice hyalino-triangularis, minute ciliata; iv. quam ii. paulo brevior, ovato-oblonga, obscure 2-dentata, arista 4 lin. longa; palea nulla. *Antheræ* 1¼ lin. longæ. *Pedicelli* steriles eleganter ciliati, quam spiculæ sessiles ¼ breviores.

UPPER GUINEA. Niger Region, Nupe, in open plains, *Barter*, 1375.

569. **Anthoxanthum madagascariense**, *Stapf* [Gramineæ-Phalarideæ] proxima *A. Ecklonii* (Hierochloæ Ecklonii, *Nees*), sed spiculis purpurascentibus minoribus distincta.

Culmi erecti vel suberecti, ad 1 ped. alti. *Folia* 3–4 basalia, et 1 vel 2 a basi remota; vaginæ glabræ, leves vel minutissime scaberulæ, striatæ; ligulæ truncatæ, ½–1 lin. longæ; laminæ lineares, subcallose acutæ, inferiores 1–3 poll. longæ 1½–2 lin. latæ, rigidulæ, secundum margines reverse pilosæ, cæterum plerumque glaberrimæ, in nervis sæpe sparse minuteque scaberulæ, prominenter striatæ. *Panicula* spiciformis, ad 2 poll. longa, ramulis pedicellisque pilosis. *Spiculæ* purpurascentes, 2½–2¾ lin. longæ; gluma i. 1-nervis quam ii. 3-nervis paulo brevior; iii. et iv. æquales, pilosulæ, 2¼ lin. longæ, vacuæ, illa supra medium breviter, haec infra medium longius aristata; v. obtusissima vel submarginata, 5-nervis, vix 1 lin. longa; palea sub flore hermaphrodito glumae v. æquilonga vel paululo longior, tenuiter 1-nervis. *Stamina* 2; antheræ 1 lin. longæ.

MADAGASCAR. Without locality, *Baron*, 2050, 4098.

This species belongs to R. Brown's genus *Ataxia* which has been reduced to *Hierochloe*, but wrongly, as it has much more in common with *Anthoxanthum*. It is very near the South African *A. Ecklonii*, Stapf (Hierochloe Ecklonii, *Nees*), which has, however, larger and pale green spikelets and sometimes a male flower with glume iii.

570. **Ehrharta delicatula**, *Stapf* [Gramineæ - Phalarideæ]; affinis *E. erectæ*, Lam., sed differt duratione annua, spiculis minoribus, staminibus 3.

Annua, ad 1½ ped. alta. *Culmi* geniculati, graciles, glabri vel minute pubescentes, circiter 3-nodi. *Foliorum* vaginæ arctæ, glabræ vel pilosæ; ligulae breves, truncatæ; laminæ lineares, 1–3½ poll. longæ, 1–2 lin. latæ, flaccidæ, minute pilosulæ vel glabrescentes. *Panicula* angusta, subsecunda, 1–3½ poll. longa, rhachi glabra filiformi, ramis capillaribus patulis simplicibus vel parce ramulosis. *Spiculæ* sæpe nutantes, 1–1½ lin. longæ; gluma i. lanceolata, acuminata, ¾ lin. longa, 3-nervis, pilosula vel glabra; ii. similis, 1 lin. longa; iii. and iv. anguste oblongæ vel obovato-oblongæ, subacuminatæ vel acutæ, 5-nerves, transverse rugosæ, ebarbatæ; iii. paululo brevior; iv. basi utrinque appendice semiorbiculari ornata; v. elliptico-oblonga, minute truncata vel subacuta, 5-nervis, iv. aequans. *Lodiculæ* glabræ. *Stamina* 3; antheræ ⅙ lin. longæ.—*E. panicea* var. *cuspidata*, Nees in *Fl. Afr. Austr.*, p. 225 (var. *mucronata*, p. 226) ex parte.

Cape Colony. Little Namaqualand, near Mieren Kasteel, among shrubs, *Drège*, 508. Tulbagh Division, Roodezand, *Drège*.

Nees quotes *E. panicea* var. *mucronata* also from the following localities: Elleboog Fontein (Little Namaqualand), Ebenezar (Clanwilliam Div.) and Slangenhuivel (Tulbagh Div.); but from the description (l.c. p. 225 & p. 226), it appears that at least some of the specimens referred to do not belong here.

571. **Ehrharta Rehmannii**, *Stapf* [Gramineæ - Phalarideæ]; proxima *E. calycinæ*, Sm., sed magis ramosa, culmis 6–8-nodis, foliis rigidioribus, spicularum glumis iii. et iv. glabris glumas i. et ii. paulo superantibus distincta.

Perennis, 1–2 ped. alta. *Culmi* a basi interdum prostrata, admodum ramosa, geniculatim erecti, graciles, leves, 6–8-nodi, internodio longissimo ad 3 poll. longo. *Foliorum* vaginæ glabræ vel reverse villosulæ; ligulæ brevissimæ, ciliatæ; laminæ lineares, breviter acutæ, 1–4 poll. longæ, 1½–3 lin. latæ, rigidæ, glaucæ, glabræ vel superne scaberulæ vel villosulæ. *Panicula* erecta, angusta, 1–4 poll. longa, subsecunda, sæpissime ad racemum redacta, ramis suberectis vel patulis rarius pendulis subcapillaribus puberulis. *Spiculæ* pallidæ, oblongæ, 2½–3 lin. longæ; glumæ i. et ii. subæquales, anguste oblongæ, obtusæ, distinctius nervosæ; iii. et iv. glumas præcedentes paulo superantes, glabræ, illa anguste lineari-oblonga acuta, haec oblonga obtusa mucronata vel minute cuspidata sæpius transverse rugosa basi utrinque appendice semilunari majusculo ornata ebarbata; v., ut in *E. calycina*, glaberrima.

Cape Colony. Without locality, *Harvey*, 318, 329, 335. Cape Div., Table Mountain, *Ecklon*, 419 (partly). Riversdale Div., Zoetmelks Riv. *Burchell*, 6712. George Div., Postberg near George, *Burchell*, 5974 ; Outeniqua Mts., Montagu Pass, *Rehmann*, 74.

Rehmann's specimens have been distributed as *E. ramosa*, var. *Rehmanni*, Hack. ms.

572. **Agrostis fissa**, *Stapf* [Gramineæ-Agrostideæ] ; proxima *A. schimperianæ*, Hochst., sed spiculis paulo majoribus et gluma iii. ad $\frac{1}{4}$–$\frac{1}{3}$ fissa e fissura aristata et arista longiore distincta.

Culmi geniculati, 2–3 ped. alti, 8–9-nodi, fere tota longitudine vaginati, nodis inclusis. *Foliorum* vaginæ laxiusculæ, leves vel scaberulæ ; ligulæ 2–3$\frac{1}{2}$ lin. longæ, in dorso scaberulæ ; laminæ lineares, setaceo-acutæ, 4–9 poll. longæ, 1$\frac{1}{2}$–2$\frac{1}{2}$ lin. latæ, planæ, flaccidæ, glaucæ, utrinque scabræ. *Panicula* laxiuscula, 6 poll. longa ; rami remote fasciculati, admodum inæquales, longiores ad 2 poll. longi, filiformes vel capillares, flexuosi, hispiduli ; pedicelli spiculis plerumque breviores. *Spiculæ* pallidæ, 1$\frac{1}{4}$–1$\frac{1}{2}$ lin. longæ ; rhachilla brevissime producta, glabra ; glumæ i. et ii. æquales vel subæquales, lanceolatæ, setaceo-acuminatæ, scaberulæ ; iii. oblonga, $\frac{3}{4}$ lin. longa, truncata, ad $\frac{1}{4}$–$\frac{1}{3}$ fissa, lobo utroque 2-dentato, glabro, 5-nervi, nervis lateralibus brevissime excurrentibus, callo glabro, arista gracillima recta vel subrecta e fissura orta ; palea 1 lin. paulo longior, 2-dentata. *Antheræ* vix $\frac{1}{2}$ lin. longæ.—*A. vestita*, Engl. *Hochgebirgsfl. trop. Afr.* p. 128 (quoad specimen citatum).

Abyssinia. 'Gageh Merki,' 8700 ft., *Schimper* (1863–8 collection), 1093.

The fissure of glume iii. may already be observed in a very young state, and the awn springs right from the base of it. When mature the awn is rather decidous.

573. **Agrostis Volckensii**, *Stapf* [Gramineæ-Agrostideæ] ; e grege *A. munroanæ*, Aitch. et Hemsl. (Calamagrostis munroanæ, *Boiss.*), foliis tenuiter setaceo-convolutis rigidulis glaucis, arista pro spiculis minutis validiuscula, rhachi brevissime continuata distincta.

Culmi graciles, e cæspitibus glaberrimis densis erecti, 1–1$\frac{1}{2}$ ped. alti, ad vel ultra medium vaginati, 1–2-nodi, nodis inclusis. *Foliorum* vaginae leves ; ligulæ ad 1 lin. longæ, hyalinæ, denticulatæ ; laminæ tenuiter setaceo-convolutæ, infimæ et innovationum ad 6 poll. longæ, rigidulæ, glaucæ, leves vel superiores scaberulæ. *Panicula* erecta, 3–6 poll. longa, angustissima, ramis remote fasciculatis admodum inæqualibus (longioribus ad 2 poll. longis) capillaribus sparse ramulosis levibus, pedicellis scaberulis. *Spiculae* virides vel purpurascentes, circiter 1 lin. longæ, rhachillae processu brevissimo pilosulo ; gluma i. et ii. lanceolatæ, acuminatæ, interdum mucronulatæ, 1-nerves, carinis scaberulis, ii. quam i. paululo brevior ; iii. quam ii. vix brevior, oblonga, truncata, pilosa, basi 5- superne 4-nervis, nervis exterioribus in setulas asperas breves interioribus in dentes productis, callo breviter barbato, arista subbasilari 2 lin. longa ad medium

geniculata infra torta; palea glumam iii. subæquans, lanceolata, 2-dentata. *Antheræ* obtusæ, $\frac{1}{4}$ lin. longæ.—*Trisetaria quinqueseta*, K. Schum. in *Engl. Pflanzenw. Ost-Afr.* C., p. 108, non Hochst.

GERMAN EAST AFRICA. Kilimandjaro, Kifinika Volcano, *Volckens*, 1856.

574. **Agrostis griquensis**, *Stapf* [Gramineæ–Agrostideæ]; affinis *A. verticillatæ*, Vill., sed gracilior, spiculis paulo minoribus, gluma iii. aristulata, antheris minimis, caryopsi lineari-oblonga sulcata.

Annua. Culmi geniculati, graciles, paucinodi, ut tota planta glabri, ad 1 ped. alti. *Foliorum* vaginæ leves; ligulæ oblongæ, acutæ, ad 1 lin. longæ; laminæ angustissime lineares, acutæ, 1–2 poll. longæ, $\frac{1}{3}$–$\frac{1}{2}$ lin. latæ, leves vel supra leviter scaberulæ. *Panicula* spiciformis, sæpe interrupta, densa, perangusta, 1–1$\frac{1}{2}$ poll. longa; rami breves, a basi ramulosi, rhachi appressi, asperuli. *Spiculæ* brevissime pedicellatæ, $\frac{1}{2}$ lin. longæ, pallide virides; rhachilla haud continuata; gluma i. et ii. subæquales, oblongæ, obtusæ vel subemarginatæ, interdum mucronulatæ, asperulæ, marginibus ciliolatis; iii. quam i. paulo brevior, truncata, apice ciliolata vel denticulata, tenuissima, obscure 5-nervis, breviter aristulata, arista terminali, callo glabro; palea $\frac{1}{3}$ brevior, hyalina. *Antheræ* $\frac{1}{8}$ lin. longæ, obtusæ. *Caryopsis* lineari-oblonga, conspicue sulcata, $\frac{1}{4}$ lin. long, in gluma iii. paleaque arcte inclusa.

SOUTH AFRICA. Griqualand West, near Griquatown, *Burchell*, 1863.

575. **Agrostis continuata**, *Stapf* [Gramineæ–Agrostideæ]; affinis *A. Elliotii*, Hack., et *A. natalensi*, Stapf, sed glumis i. et ii. tenuiter acuminatis, iii. pilosa, rhachilla continuata distincta.

Culmi erecti, 1–2 ped. alti, ut tota planta glabri, paucinodi. *Foliorum* vaginæ arctæ, glabræ; ligulæ 1 lin. longæ, obtusæ; laminæ lineares, acute attenuatæ, ad 6 poll. longæ, 1–1$\frac{1}{4}$ lin. latæ, plus minusve flaccidæ, scaberulæ vel subtus leves. *Panicula* subspiciformis, interrupta ad 6 poll. longa, rami fasciculati, fasciculis densis erectis oblongis, admodum inæquales, longiores ad 2$\frac{1}{2}$ poll. longi ad 6–9 lin. lati simplices, cæteri a basi ramulosi, parce asperuli; pedicelli plerumque spiculis breviores. *Spiculæ* virescentes 2 lin. longæ; rhachilla brevissime producta, arista gracillima $\frac{1}{4}$–2 lin. longa vel rarius gluma imperfecta terminata; glumæ i. et ii. æquales vel subæquales, lineari-lanceolatæ, tenuiter acuminatæ, scaberulæ; iii. oblonga, 1 lin. sublongior, tenuis, inferne 5- superne 4-nervis, 4-dentata vel 4-mucronata (mucronibus exterioribus plerumque longioribus) secundum nervos pilosula, callo minute pilosulo, arista supra basin orta scabra medio subgeniculata; palea quadrato-oblonga, 2-dentata, hyalina, $\frac{1}{3}$–$\frac{1}{2}$ lin. longa. *Antheræ* $\frac{3}{4}$ lin. longæ.

BRITISH CENTRAL AFRICA. Nyasaland, *Buchanan* (1891 collection), 356.

576. **Agrostis natalensis**, *Stapf* [Gramineæ–Agrostideæ]; *A. Elliotii*, Hack., affinis, sed foliis multo angustioribus, spiculis paulo longioribus, gluma iii. breviore et latiore, palea truncata distincta.

Perennis, 2–3 ped. alta. *Culmi* erecti, ut tota planta glabri, 5–6-nodi. *Foliorum* vaginæ subarctæ, leves; ligulæ ½–¾ lin. longæ; laminæ anguste lineares, tenuiter attenuatæ, 3–7 poll. longæ, ½–1 lin. latæ, planæ, flaccidæ, minute scaberulæ vel fere leves. *Panicula* erecta, spiciformis, lobata, 4–7 poll. longa; ramuli fasciculati, fasciculis densissimis oblongis, admodum inæquales, ad 1½ poll. longi, a basi ramulosi vel longiores ad 3–4 lin. simplices, scaberuli; pedicelli brevissimi. *Spiculæ* pallide virides, circiter 2½ lin. longæ; rhachilla non producta; glumæ i. et ii. subæquales, lineari-oblongæ, mucronatæ, scaberulæ, carina validiuscula; iii. oblonga, truncata, 4-dentata vel 4-mucronata, 1 lin. longa, basi 5-nervis, superne 4-nervis, callo parce pilosulo, arista recta supra basin orta scabra; palea quadrato-oblonga, truncata, hyalina, ¼–⅓ lin. longa. *Antheræ* apiculatæ, ½ lin. longæ. *Caryopsis* oblonga, a dorso compressa, sulcata ⅞ lin. longa.

NATAL. Umpumulo, 2000 ft., *Rev. J. Buchanan*, 159.

This and the preceding species, as well as *A. Elliotii*, are also allied to *A. antarctica*, Hook. fil., and to a few South American species which were described by Nees under *Bromidium*, but they differ from them in the subbasal insertion of the awn.

577. **Avena Newtonii**, *Stapf* [Gramineæ–Aveneæ]; affinis *A. Neesii*, Hook. fil., glumis i. et ii. fere duplo latioribus 4–7-nervibus, iii. 9–11-nervi distincta.

Culmi ut tota planta glabri. *Foliorum* culmorum vaginæ subarctæ, leves, prominenter nervosæ; ligulæ truncatæ, ½ lin. longæ; laminæ lineares, tenuiter attenuatæ, 3–5 poll. longæ, 1–1½ lin. latæ, planæ, superne et secundum margines minute scaberulæ. *Panicula* angusta, erecta, ½ ped. alta; rami subremote geminati, inæquales, longiores ad 3 poll. longi a basi parce ramulosi vel ad 1 poll. simplices, filiformes, scabri. *Spiculæ* 5½–6½ lin. longæ, 2–8-floræ; rhachilla tenuis, articulo primo minuto glabro, caeteris ad 2 lin. longis longe pilosis; gluma i. lanceolata, subacuminata, 3½ lin. longa, admodum tenuis, 4–5-nervis; ii. similis, 5 lin. longa, 5- vel sub 7-nervis; glumæ florentes breviter exsertæ, lanceolatæ, glabræ, tenuiter granulosæ, prominenter 9- vel sub 11-nerves, apice bifidæ, lobis scariosis subaristulatis, iii. 5½–6½ lin. longa, callo parvo barbato, arista e medio inserta columna 3 lin. seta 6 lin. longa; paleæ lineari-lanceolatæ 3½ lin. longæ, carinis ciliatis. *Lodiculæ* oblongæ bifidæ, ⅞ lin. longæ. *Caryopsis* lineari-oblonga, superne puberula, 2 lin. longa.

PORTUGUESE WEST AFRICA. Mossamedes, Serra da Chella, *Newton*, 6.

578. **Avena muriculata**, *Stapf* [Gramineæ–Aveneæ]; affinis *A. Neesii*, Hook. fil., spiculis minoribus, glumis vacuis tenuibus subhyalinis, glumis fertilibus conspicue scaberulis tenuiter 7-nervibus distincta.

Perennis. *Culmi* erecti, 2½–3½ ped. alti, glabri, leves, circiter 3-nodi. *Folia* 4–6 prope basin congesta, 3–4 remotiora; vaginæ firmiusculæ, arctæ, glabræ, leves; ligulæ rotundatæ, ad 1¾ lin. longæ; laminæ lineares, acute attenuatæ, ½–1 ped. longæ, 1½–2 lin. latæ, planæ, firmæ, plerumque glabræ, leves. *Panicula* angusta,

erecta, 5-7 poll. longa; rami geminati vel 3-4-nati, longiores ad 3 poll. longi, nutantes, simplices ad 1-1½ poll., filiformes, scabridi *Spiculæ* erectæ, 4-5 lin. longæ, 2-3-floræ; rhachillæ articuli ad 1½ lin. longi, pilosi; glumæ vacuæ tenues, subhyalinæ, lanceolatæ; i. 3-nervis, 3-3½ lin. longa; ii. 3-5-nervis, 4-4½ lin. longa; glumæ florentes breviter exsertæ, lanceolatæ (iii. 4-4½ lin. longa), glabræ, scaberulæ, tenuiter 7-nerves, sub apice scariosæ purpurascentes, bifidæ, lobis aristulatis, callo parvo barbato, arista medio orta 7-8 lin. longa; paleæ lineares, 3 lin. longæ, carinis superne longiuscule ciliatis. *Antheræ* 1½ lin. longæ. *Ovarium* supra medium hispidulum.—*A. Neesii*, Schweinf., *Beitr. Fl. Aethiop.* p. 298, non Hook. fil. *Trisetum Neesii*, Hochst. ex *Steud. Syn. Gram.* p. 227. *Danthonia elongata*, Hochst. in *Flora*, 1841, I. *Intell. Bl.* p. 20; A. Rich., *Tent. Fl. Abyss.* II. p. 419.

ABYSSINIA. Without locality, *Schimper*, III. 1993; Tigre, Mt. Sholoda, *Schimper*, I. 402; Amba Harres, 7500 ft., *Schimper* (1862 collection), 1002; Shoa, Ankober, *Roth*. Eritrea: Mt. Bizen, 6000 ft. *Schweinfurth* (1892 collection), 2018.

579. **Avena Rothii**, *Stapf* [Gramineæ-Aveneæ]; affinis *A. lachnanthæ*, Hook. fil., sed paniculis laxioribus gracilioribus, spiculis minoribus magis dispersis, glumis fertilibus tenuius nervosis distincta.

Culmi e basi debili gracili longe ascendentes, 3-4 ped. longi, glabri, leves, multinodi. *Foliorum* vaginæ laxæ, glabræ vel infimæ primo puberulæ, leves; ligulæ truncatæ, ad 2 lin. longæ; laminæ lineares, tenuiter attenuatæ, 5-7 poll. longæ, 2 lin. latæ, flaccidæ, glabræ, rarissime pubescentes, supra et in marginibus minute scaberulæ. *Panicula* angusta, laxa, 4-9 poll. longa, erecta vel subnutans; rami remote semiverticillati, admodum inæquales, parce ramulosi vel simplices, tenuiter filiformes, flexuosi, scaberuli, longiores ad 2 lin. longi. *Spiculæ* dispersæ, 3½-5 lin. longæ, laxe 3-4-floræ; rhachillæ articulæ superiores ad 1¼ lin. longæ, longe pilosæ; glumæ vacuæ pertenues, i. lanceolata, acuta, 1-nervis, 1½-2 lin. longa; ii. obverse lanceolata, acuta vel breviter acuminata, 2½-3 lin. longa, 3-nervis; glumæ florentes longe exsertæ, oblongo-lanceolatæ, ad 3½ lin. longæ, glabræ, pallide virides, rarius sub apice purpurascentes, leves, tenuiter nervosæ, apice scariosæ, bidentatæ, dentibus acutis vel subaristulatis, callo minuto barbato, arista supra medium orta tenui columna laxe torta 1¼ lin. seta 5-7 lin. longa; paleæ oblongo-lineares, 2½ lin. longæ, carinis scaberulis. *Antheræ* ¾ lin. longæ. *Ovarium* apice hispidum, deinde ad medium puberulum.—*A. lachnantha*, Schweinf. *Beitr. Fl. Aethiop.* p. 298, non Hook. fil. *Trisetum lachnanthum*, Hochst. ex A. Rich. *Tent. Fl. Abyss.* II. p. 416.

ABYSSINIA. Simen, Mt. Aber near 'Dschenausa,' *Schimper*, II. 859; Shoa, *Roth*.

580. **Avena longa**, *Stapf* [Gramineæ-Aveneæ]; affinis *A. dregeanæ*, Stapf (Triseto dregeano, *Steud.*), sed panicula multo longiore flaccida laxe contracta et foliis longis flaccidis distincta.

Cæspitosa, perennis. *Culmi* erecti, 2-3 ped. alti, glabri, circiter 3-nodi, ad fere basin paniculae vaginati. *Folia* 3-6 prope

basin congesta, 3 remotiora; vaginæ laxiusculæ, glabræ, leves; ligulæ truncatæ, ad 1½ lin. longæ; laminæ lineares, longe tenuiterque attenuatæ, 6–10 poll. longæ, 1½–3 lin. latæ (summa 1–2 poll. longa), planæ vel plus minusve involutæ, flaccidæ, glabræ, leves. *Panicula* laxe contracta, 9–10 poll. longa, nutans vel flexuosa; rami semiverticillati, longiores ad 2½ poll. longi, filiformes, flexuosi, fere a basi ramulosi vel simplices. *Spiculæ* angustæ, 6–9 lin. longæ, 4–5-floræ; rhachilla gracillima, articulis ad 1½ lin. longis, longe pilosis; glumæ vacuæ acuminato-lanceolatæ, i. 3½–4 lin., ii. 4½–5 lin. longa; glumæ florentes longe exsertæ, lanceolatæ (iii. 5 lin. longa), glabræ, firmiusculæ, leves, pallide virides vel sub apice scarioso scaberulo bifido purpurascentes, lobis aristulatis, callo subulato piloso, arista supra medium orta tenui 10–12 lin. longa; paleæ 3½ lin. longæ, carinis ciliolatis. *Antheræ* 1¼–1½ lin. longæ. *Ovarium* praeter basin glabrum puberulum et in apice hispidulum.—*Trisetum antarcticum*, Nees in *Linnæa* xx. p. 254, nec *Linnæa* vii. p. 301.

CAPE COLONY. Cape of Good Hope, *R. Brown*; Cape Flats, Doorn Hogte, *Ecklon and Zeyher* 1807, 1807 B.

581. **Avena turgidula,** *Stapf* [Gramineæ-Aveneæ]; valde affinis *A. antarcticæ*, Thunb., sed spiculis ob glumas latiores magis approximatas plus minusve imbricatas turgidulis.

Perennis. *Culmi* erecti, 1–2½ ped. alti, glabri, 2–3-nodi. *Folia* pauca prope basin congesta, circiter 3 remotiora; vaginæ subarctæ, glabræ vel minutissime puberulæ; ligulæ truncatæ, ad ¾ lin. longæ; laminæ lineares, acute attenuatæ, ad 6 poll. longæ, 1½ lin. latæ, planæ vel involutæ, flaccidæ vel rigidulæ, subglaucæ, plerumque glabræ, superne scaberulæ. *Panicula* contracta, erecta vel subnutans, ½–1 ped. alta; rami semiverticillati, admodum inæquales, longiores ad 1½ poll. longi, parce ramulosi vel simplices, filiformes, scabri. *Spiculæ* 4–5½ lin. longæ, virides, turgidulæ, 3–4-floræ; rhachilla gracilis articulis parce vel crebrius pilosis ad 1 lin. longis; glumæ vacuæ lanceolatæ, acuminatæ, i. 2½–3 lin., ii. 4–4½ lin. longa; glumæ florentes exsertæ, oblongo-lanceolatæ, (iii. 3½–4 lin. longa), glabræ, pallide virides, obscure granulatæ, apice scariosæ, bidentatæ, dentibus aristulatis, callo brevissimo barbato, arista e medio orta tenui 7–9 lin. longa; paleæ lineares, 3 lin. longæ, carinis ciliatis. *Antheræ* ½–1 lin. *Ovarium* supra medium pubescens, apice hispidulum. *Caryopsis* 1¼ lin. longa. —*Trisetum imberbe*, Nees, *Fl. Afr. Austr.* p. 347; *T. antarcticum*, Nees, l.c. p. 346 (partim).

SOUTH AFRICA. Cape Colony: without locality *Zeyher*, 463. Queenstown Div.: Shilo, 3500 ft., *Drège*; *Baur* 776. Alival North Div.: Leuuwenspruit, 4500–5000 ft., *Drège*. Transkei Div.: Gekau, below 1000 ft., *Drège*. Tembuland: Bazeia, 2000 ft., *Baur*, 504. Natal: Umzinga, foot of Bigarsberg, *Rev. J. Buchanan*, 100; Greytown, *Rev. J. Buchanan*, 172; Reit Vlei, 4000–5000 ft., *Rev. J. Buchanan*, 156. Transvaal: Pretoria, Wonderboomport, *Rehmann* 4493.

582. **Avena caffra,** *Stapf* [Gramineæ-Aveneæ]; affinis *A. antarcticæ*, Thunb., sed panicula flexuosa, rhachilla longe pilosa, glumis florentibus tenuibus levibus distincta.

Perennis. *Culmi* 2 ped. alti, erecti, glabri, 3–4-nodi, ad fere basin paniculæ vaginati. *Folia* 4–6 prope basin congesta, 3 remotiora; vaginæ glabræ, leves; ligulæ oblongæ, ad $\frac{3}{4}$ lin. longæ; laminæ angustissimæ, subsetaceo-convolutæ, acutæ, inferiores 5–7 poll. longæ (eae innovationum subpedales), glabræ, marginibus scabris. *Panicula* contracta, circiter 6 poll. longa, subnutans, flaccidula; rami semiverticillati, admodum inæquales, parce ramulosi vel simplices, tenuiter filiformes, longiores ad 2 poll. longi, flexuosi, scaberuli vel hispiduli. *Spiculæ* 4–4$\frac{1}{2}$ lin. longæ, laxe 3-4-floræ; rhachilla gracillima, articulis ad 1 lin. longis longe pilosis; glumæ vacuæ pertenues, lanceolatæ, acuminatæ, i. 2–2$\frac{1}{2}$, ii. 2$\frac{1}{2}$–3$\frac{1}{2}$ lin. longæ; glumæ florentes exsertæ, lineari-lanceolatæ (iii. 3–4 lin. longa), glabræ, pallidæ, tenues, leves, tenuissime nervosæ, apice scariosæ, subbifidæ, 2-aristulatæ, callo parvo barbato, arista supra medium orta tenui 7 lin. longa; paleæ lineares, 3 lin. longæ, carinis minute ciliolatis. *Antheræ* ad 1$\frac{1}{2}$ lin. longæ. *Ovarium* apice hispidulum.—*Trisetum longifolium*, Nees, *Fl. Afr. Aust.* p. 348 (partim).

CAPE COLONY. Alival North Div.: Wittebergen, on rocks, 7500 ft., *Drège.*

583. **Tristachya tuberculata,** *Stapf* [Gramineæ-Aveneæ]; proxima *T. barbatæ*, Nees, distincta foliis culmorum quam vaginis multo angustioribus, spiculis minoribus, glumis i. et ii. glanduloso-setaceis, gluma iii. 3-nervi, iv. minute barbulata.

Culmi graciles, 3–4 ped. alti, 3-nodi. *Folia* culmorum tantum nota, vaginis arctis glabris levibus quam internodiis multo brevioribus, laminis angustis $\frac{1}{2}$–1 lin. longis quam vaginis multo angustioribus. *Spicularum* umbellæ numerosæ in paniculas erectas subcontractas dispositæ, ramis filiformibus capillaribusve scabridis interdum tuberculatis, longioribus ad 3 poll. longis, pedunculis apice albo-setosis, pedicellis $\frac{1}{2}$ lin. longis; gluma i. ovato-lanceolata, subacuta, 2 lin. longa, utrinque secundum nervos laterales serie glandularum setigerarum notata; ii. oblongo-lanceolata, subacuta, 3–4 lin. longa, ut i. biseriatim glanduloso-setosa; iii. oblongo-lanceolata, acuta, 3–4 lin. longa, 3-nervis, minute pubescens, paleam obtusam 1$\frac{1}{2}$ lin. longam gerens; iv. lineari-oblonga, a callo ad aristæ insertionem 1$\frac{3}{4}$ lin. longa, bifida lobis in setas 3–4 lin. longas productis, albida, ad loborum basin barbula submarginali sericea ornata, cæterum pubescens, callo sericeo-barbato pungente, aristæ columna atra 4–5 lin. seta pallida 8–10 lin. longa; palea lineari-oblonga obtusa 1$\frac{1}{2}$ lin. longa. *Stamina* in utroque flore 3, antheris $\frac{3}{4}$–1 lin. longis. *Ovarium* glabrum. *Caryopsis* obovoideo-oblonga, 1 lin. longa, sulcata, embryone magno.

WEST TROPICAL AFRICA. Senegambia, *Heudelot*, 141; Sierra Leone, Sasseni by the Scarcies River, on dry rocks, *Scott Elliot*, 4536.

584. **Tristachya glabra,** *Stapf* [Gramineæ-Aveneæ]; inter species adhuc descriptas *T. mexicanæ*, Kunth, simillima, sed glumæ iv. lobis in setas longe productis atque ovario summo stylisque villosis distincta.

Culmi 1½–3 ped. alti, 1-nodi. *Folia* pleraque ad culmorum basin congesta, vaginis firmis imis inferne villosis cæteris sparse hirtis vel glabris, laminis 4–6 poll. longis, 1–1½ lin. latis rigidis sparse hirtis vel glabris. *Spicularum* capitula 3–9, in racemos erectos disposita, 1–1¼ poll. longa, pedunculis infimis 2–3-natis ad 1½ poll. longis; gluma i. lanceolata, acuta, 7–10 lin. longa, glaberrima; ii. longe subulato-acuminata, 12–15 lin., glaberrima; iii. glumæ ii. similis, sed 10–12 lin. longa, 5–7-nervis, paleam bidentatam 9–10 lin. longam gerens; iv. lineari-lanceolata, involuta, a callo ad aristæ insertionem 3½ lin. longa, albida, pubescens, 5-nervis, bifida, lobis in setas ad 10 lin. longas productis, callo pungente villoso 1¼ lin. longo, arista scabrida 2½–3 poll. longa; palea apice truncata et cochleariformis. *Stamina* in utroque flore 3, antheris 2½–3 lin. longis. *Ovarium* apice villosum; styli villosi.

Central and South Africa. Shire Highlands: Blantyre, *L. Scott.* Transvaal: Makapans Range, Strydpoort, *Rehmann*, 5383; Johannesburg, *Barber*; Potchefstroom, *Nelson*, 31.

585. **Tristachya biseriata,** *Stapf* [Gramineæ-Aveneæ]; *T. glabræ*, Stapf, (vide supra) affinis, foliis angustissimis subsetaceis et gluma i. biseriatim glandulosa setosa ii. æquilonga distincta.

Culmi graciles, 1–1½ ped. alti, 1-nodi. *Folia* pleraque ad culmorum basin congesta, vaginis arctis firmis infimis inferne dense tomentosis, laminis angustissime linearibus sæpissime convolutis subsetaceis ad 9 poll. longis glaucis glabris. *Spicularum* capitula 6–7, in racemos erectos contractos disposita, 10–11 lin. longa, pedunculis infimis geminatis vel solitariis ad 1½ poll. longis; gluma i. lanceolata, acuminata, circiter 10 lin. longa, utrinque secundum nervos laterales serie glandularum nigrarum setigerarum ornata; ii. ei æquilonga, pubescens, eglandulosa; iii. præcedenti similis, 8–8½ lin. longa, paleam obtusam 7 lin. longam gerens; iv. lanceolato-linearis, a callo ad aristae insertionem 3½ lin. longa, albida, pubescens, 7-nervis, bifida, lobis in aristas 4–5 lin. longas productis, callo pungente villoso ½ lin. longo, arista scabrida 1¼–1½ poll. longa; palea obtusa apice interdum subcochleariformis. *Stamina* in utroque flore 3; antheræ haud visæ. *Ovarium* summum et styli villosi.

South Africa. Basutoland: Leribe, *Rev. J. Buchanan*, 220.

586. **Trichopteryx gigantea,** *Stapf* [Gramineæ-Aveneæ]; ab omnibus speciebus huius generis differt magnitudine omnium partium, et a plerisque præterea staminibus 3, haud 2.

Culmi robusti, 5–12 ped. alti, erecti, tactu asperi vel leves. *Folia* pleraque basalia vel subbasalia, vaginis firmis præter infimas basi tomentosas glabris levibus, ligulis ad pilorum seriem reductis, laminis linearibus vel lineari-lanceolatis setaceo-acuminatis, ½–1 ped. longis, 6–8 lin. latis glabris glaucis supra asperis. *Panicula* stricta, contracta, ½–1 ped. longa, rhachi aspera glauca vel albida ad nodos imos villosula, ramis strictis scabris geminatis vel semiverticillatis. *Spiculæ* flavido-brunneæ, erectæ, subcoriaceæ, glabræ, 1¼–1½ poll. longæ; gluma i. lanceolata, acuta, 3- rarius 5–7-nervis, 7½ lin. longa; ii. lanceolata, longe subulato-acuminata, 1¼–1½ poll. longa, 3-nervis; iii. lineari-oblonga, acuta, 10–11 lin.

longa, 5-nervis, interdum nervo uno alterove brevi addito, paleam obtusam 4–5 lin. longam gerens; iv. lineari-oblonga, teres, 6 lin. longa, a callo ad aristæ insertionem albida demum nigricans, nitida, pubescens, breviter acuteque biloba, callo longo pungente villoso-barbato, aristæ columna ad $3\frac{1}{2}$ poll. longa, seta brevi; palea linearis, subbifida, $6\frac{1}{2}$ lin. longa, carinis crassis approximatis. *Stamina* 3 in utroque flore; antheræ 4 lin. longæ. *Ovarium* glabrum. *Caryopsis* linearis, $4\frac{1}{2}$ lin. longa, teres, sulcata; embryo $1\frac{1}{2}$ lin. longus.

TROPICAL AFRICA. Sudan: Bongo land, Doluthe by the Roah, *Schweinfurth*, 2260. Upper Zambesi region: southwest of Victoria Falls, *Baines*; Deykah River, south of Victoria Falls, *Holub.*

I have little doubt that this is De Notaris' *Loudetia superba* from Upper Nubia, which I know only from the description in Ann. Sc. Nat. Ser. III., XIX. p. 369, a description which is a mixture of accurate observation and singular misconception. De Notaris describes the spikelets as 3-flowered, *viz.* with a "neuter" flower at the base of the pale of the male flower and appressed to it, and consisting of a very short fleshy earshaped "palea." He mistook evidently a lodicule for an additional "neuter" flower. At the same time he says there are no "paleolæ," *i.e.* lodiculæ. The statement that the pale of the male flower is 6-nerved, is apparently also due to erroneous observation, the wings of the keels and the side parts often overlapping in such a way as to produce the impression of several lateral nerves. Otherwise, De Notaris' description answers almost exactly that given here of *T. gigantea.*

587. **Trichopteryx camerunensis,** *Stapf,* [Gramineæ-Aveneæ]; *T. eleganti,* A. Rich., affinis, sed foliis brevibus, nodis fere semper glaberrimis, panicula minus composita, spiculis paulo majoribus glaberrimis distincta.

Culmi graciles, erecti vel basi geniculati, 1–$2\frac{1}{2}$ ped. alti, glabri, 2–3-nodi. *Folia* 3–4 basalia vel subbasalia, 1–3 remota, vaginis arctis firmis hirsutis vel glabrescentibus ad nodos fere semper glaberrimis imis persistentibus haud in fibras solutis, laminis linearibus acutis 2–4 poll. longis 2–$2\frac{1}{2}$ lin. latis viridibus hirsutis vel glabrescentibus. *Panicula* erecta vel subnutans, 2–6 poll. longa, contracta vel subaperta, ramis inferioribus 2–3-natis flexuosis filiformibus scaberulis 3–2-spiculatis vel simplicibus. *Spiculæ* brunneæ, nitidæ, glaberrimæ, $5\frac{1}{2}$–$6\frac{1}{2}$ lin. longæ; gluma i. ovata, obtusa, 2 lin. longa; ii. lanceolata, obtusa, $5\frac{1}{2}$–$6\frac{1}{2}$ lin. longa; iii. lanceolata, acuminata, ii. subæqualis, 3-nervis; iv. lineari-oblonga, pubescens, 3 lin. longa, breviter bifida, callo brevi tomentoso barbato basi exciso, arista subgracili $1\frac{1}{2}$–2 poll. longa ad $\frac{1}{3}$ inferiorem geniculata. *Stamina* 2. *Ovarium* glabrum. —*Loudetia elegans*, Hook. fil. in *Journ. Linn. Soc.* VII. p. 229, non Hochst.

Upper GUINEA. Cameroon Mountains, *Mann*, 1346, 2080.

I found the nodes always perfectly glabrous, with a single exception, in which near the base of a culm there were a few stiff hairs present.

588. **Trichopteryx nigritiana,** *Stapf* [Gramineæ-Aveneæ]; valde affinis *T. simplici*, Benth., differt culmis strictissimis gracilioribus, foliis perlongis angustissimis sæpius planis superne capillaribus, paniculis pedalibus vel ultrapedalibus flavidis uberibus.

Culmi e cæspitibus densis strictissimi, graciles, 2½–3 ped. alti, glabri vel hirsuti, 2–3-nodi. *Folia* circiter 2 prope basin, 2–3 remota, vaginis arctis glabris vel hirsutis ad nodos barbatis vel glabris infimis basi tomentosis demum in fibras solutis, ligulis ad seriem pilorum reductis, laminis angustissime linearibus 1–1½ ped. longis ad 1 lin. latis apicem versus longe capillaribus glabris hirsutisve rigidis. *Panicula* contracta, densa vel laxiuscula 1–1¼ ped. longa, flavida, ramis sæpe permultis semiverticillatis capillaribus longioribus ad 6 lin. metientibus sæpeque ad medium simplicibus. *Spiculæ* 4½–6 lin. longæ, glabræ, structura *T. simplicis* nisi gluma ii. saepe iii. æquante vel subsuperante.

UPPER GUINEA. Niger region: Nupe, Jeba, *Barter.*

589. **Trichopteryx acuminata,** *Stapf* [Gramineæ-Aveneæ]; habitu *T. nigritianæ*, Stapf, (vide supra) similis, glumis longe setaceo-acuminatis, staminibus 3 distincta.

Culmi graciles, 4 ped. alti, glabri, leves. *Folia* superiora tantum nota, vaginis glaberrimis arctis, ligulis ad seriem pilorum minutorum redacta, laminis convolutis setaceis capillariter attenuatis, 4–6 poll. longis, glabris vel supra minutissime puberulis. *Panicula* erecta, angusta, laxiuscula, circiter 9 poll. longa, rhachi glabra, ramis capillaribus suberectis sublevibus sæpius fere a basi spiculigeris, spiculis infimis imperfectis. *Spiculæ* flavidæ, 5 lin. longæ; gluma i. lanceolata, setaceo-acuminata, 2½–3 lin. longa, tenuis; ii. similis, sed angustior, longius acuminata, 5 lin. longa; iii. ut ii. nisi nervis lateralibus submarginalibus, paleam apice longiuscule hyalinam 3 lin. longam gerens; iv. lineari-oblonga, 1½–2 lin. longa, superne minute puberula, breviter bifida, callo barbato parvo, arista gracili scabrida 1–1½ poll. longa ad vel infra medium geniculata. *Stamina* in utroque flore 3; antherae ¾–1 lin. *Ovarium* glabrum.

UPPER GUINEA. Niger region: Nupe, *Barter.*

590. **Trichopteryx hordeiformis,** *Stapf* [Gramineæ-Aveneæ; inter generis species panicula densa aristis longissimis crinita distinctissima, annua.

Annua, gregaria. *Culmi* stricti, 3 ped. alti, glabri, 3-nodi. *Foliorum* vaginæ erectæ, superne hirsutæ, secundum margines ciliatæ, ad nodos barbatæ; ligulæ ad pilorum seriem reductæ; laminæ lineares, apice sectaceæ, 6–9 poll. longæ, 2–3 lin. latæ, planæ vel plus minusve revolutæ, hirsutæ, superne purpurascentes. *Panicula* contracta, densissima, 1 ped. longa, rhachi compressa ad angulos scabra, ramis filiformibus scabris semiverticillatis paucispiculatis appressis brevioribus. *Spiculæ* flavidæ, 6½–7½ lin. longæ, glanduloso-setosæ; gluma i. oblonga, obtusa, 2–3 lin. longa; ii. lanceolata, longe rostrato-acuminata, truncata, 6½–7½ lin. longa; iii. lanceolato-oblonga, subacuta, 3½–4 lin. longa, paleam acutam 1½–2 lin. longam gerens; iv. oblongo-linearis,

$1\frac{1}{2}$–2 lin. longa, pubescens, breviter bifida, callo villoso barbato gracili acuto, arista hispidula columna 1 poll. seta 3–4 poll. longa; palea linearis, subobtusa $1\frac{1}{2}$ lin. longa. *Stamina* in utroque flore 2; antherae $1\frac{1}{2}$ lin.

UPPER GUINEA. Niger region: Nupe and Borgu, *Barter*, 954.

Barter states that in Borgu the inner plains covered with this gregarious species resemble barley crops.

591. **Trichopteryx annua,** *Stapf* [Gramineæ-Aveneæ]; proxima *T. hordeiformi*, Stapf, (vide supra), sed foliis brevibus et panicula laxiuscula minore multo pauperiore distincta.

Culmi solitarii vel 2–3 fasciculati, stricti, 2 ped. alti et ultra, leves, 3-nodi. *Foliorum* vaginæ arctæ, glabræ vel tuberculis setigeris parce aspersæ; ligulæ ad seriem pilorum reductæ; laminæ lineares, apice subsetaceo-attenuatæ, $2\frac{1}{2}$–4 poll. longæ, 1–2 lin. latæ, planæ vel marginibus revolutæ, sæpius horizontaliter patentes, subrigidæ, glaucæ, tuberculis setigeris imprimis secundum marginem instructæ. *Panicula* stricta, angusta, ad 5 poll. longa, laxiuscula, rhachi inferne tereti glabra, ramis semiverticellatis geminatisve filiformibus simplicibus vel 2–3-spiculatis, brevibus. *Spiculæ* flavidæ, ad $7\frac{1}{2}$ lin. longæ, glanduloso-setosæ vel subglabræ, rarius glaberrimæ; gluma i. ovato-oblonga, obtusa, $2\frac{1}{2}$–3 lin. longa; ii. lanceolata, rostrato-acuminata, obtusa vel truncata, ad $7\frac{1}{2}$ lin. longa; iii. quam secunda multo brevior, truncatula.

SUDAN. Jur: Ghattas' chief seriba, *Schweinfurth*, 2007.

The spikelets are too young for complete description; but the plant is so well marked, that it is easily recognisable from the characters given above. The awns are 1–$1\frac{1}{4}$ in. long in the most advanced spikelets.

592. **Trichopteryx flavida,** *Stapf* [Gramineæ–Aveneæ]; affinis *T. simplici*, Benth., sed vaginis infimis latiusculis albidis longe villosis haud in fibras solutis, spiculis paulo minoribus pro longitudine latioribus, gluma i. longiore acutissima, iv. 9-nervi distincta.

Cæspitosa. Culmi erecti, ad $1\frac{1}{2}$ ped. alti, glabri vel superne pilosi, 3-nodi. *Foliorum* vaginæ arctæ, infimæ basi latiusculæ atque longe albido-villosæ, subpersistentes, haud in fibras solutæ, superiores glabræ. *Panicula* subflexuosa, angusta, 3–6 poll. longa, rhachi interdum pilosa, ramis paucispiculatis filiformibus scabridis, 3–2-natis. *Spiculæ* flavidæ, 4–5 lin. longae, glabræ; gluma i. ovata, peracuta, $2\frac{1}{2}$–3 lin. longa; ii. lanceolata, truncata, 4–5 lin. longa; iii. lanceolata, acuta, ii. subæqualis; iv. lineari-oblonga, 2 lin. longa, a callo ad aristæ insertionem pubescens, 9-nervis, bifida, callo parvo pungenti-villoso barbato, arista gracili infra medium geniculata 1 poll. longa. *Stamina* in utroque flore 2; antheræ 1 lin. longæ.

SOUTH AFRICA. Transvaal: Pretoria, *Rehmann*, 4730; Magalies Mountains, Derde Poort, *Nelson*, 75.

593. **Trichopteryx ramosa,** *Stapf* [Gramineæ-Aveneæ]; inter omnes species generis habitu suffrutescente ramoso insignis.

Suffrutescens, ramosa, glaberrima, ad 1½ ped. alta, ramis culmisque gracilibus. *Foliorum* vaginæ infimæ latiusculæ, apertæ, ut ceteræ tenuiter striatæ; ligulæ ad seriem pilorum brevissimorum reductæ; laminæ angustæ, lineares, sectaceo-attenuatæ, 3–4 poll. longæ, 1–1½ lin. latæ. *Panicula* angustissima, 2–4 poll. longa, erecta vel subflexuosa, rhachi ramisque paucispiculatis ei appressis levibus. *Spiculæ* pallidæ, 3–3½ lin. longæ; glumæ tenues; i. lanceolato-oblonga, acuta,, 2–2½ lin. longa; ii. lanceolata, acuta, 3–3½ lin. longa; iii. priori similis, 7-nervis, nervis intimis abbreviatis, paleam lanceolato-oblongam 2½ lin. longa m gerens; iv. lineari-oblonga, 2–2½ lin. longa, glabra, demum purpureo-nigricans, bifida, 7-nervis, callo obtuso parvo barbato, arista tenui 4 lin. longa infra medium torta; palea lineari-lanceolata, 2½ lin. longa. *Stamina* in utroque flore 2. *Ovarium* glabrum. *Caryopsis* obovoideo-oblonga, 1 lin. longa, sulcata, embryone magno ¾ lin. longo.

SOUTH AFRICA. Kalahari Region: Griqualand, Klip Fontein, *Burchell*, 2164.

594. **Alsophila Batesii**, *Baker* [Filices-Cyatheaceæ]; ex affinitate *A. obtusilobæ*, Hook.

Caudex 2–3 pedalis. *Stipites* elongati, graciles, nudi, inermes, sesquipedales. paleis basalibus rigidis castaneis lanceolatis acuminatis. *Frondes* oblongo-deltoideæ, bipinnatæ, membranaceæ, utrinque virides, glabræ, 3–4 pedes longæ, 15–18 poll. latæ, rhachi nuda inermi, pinnis lanceolatis sessilibus ad basin pinnatis, inferioribus paucis, centralibus brevioribus majoribus 8–9 poll. longis 18–20 lin. latis, segmentis secundariis linearibus obtusis obscure crenulatis 2½ lin. latis, venulis perspicuis 14–15-jugis profunde furcatis. *Sori* parvi, intramediales, ad furcam venarum impositi.

UPPER GUINEA. Cameroon Mountains: Forest at Efulen, *Bates*, 307.

Besides *A. Batesii* only three species of *Alsophila* are known from Tropical Africa.

595. **Polypodium (Phegopteris) efulense**, *Baker* [Filices-Polypodiaceæ]; ex affinitate *P. Vogelii*, Hook., et *P. nigritani*, Baker.

Stipites longissimi, graciles, fragiles, supra basin straminei, nudi, 2–3-pedales, paleis subbasalibus lanceolatis firmulis brunneis concoloribus. *Frondes* deltoideæ, decompositæ, membranaceæ, utrinque virides, facie præter costas glabræ, dorso obscure pubescentes, tripedales, pinnis infimis distincte petiolatis quam reliquis multo majoribus inæquilateralibus latere inferiore valde productis, segmentis ultimis oblongis obtusis crenatis basi in alam costularem confluentibus 2–2½ lin. lata, venulis laxis obscuris erecto-patentibus ultimis furcatis. *Sori* parvi, inter costam et marginem uniseriales, mediales.

UPPER GUINEA. Cameroon Mountains: Forest Hill, Efulen, *Bates*, 217.

596. **Polypodium (Grammitis) microphyllum**, *Baker* [Filices-Polypodiaceæ]; dense cæspitosum, ad *P. Gilpinæ*, Baker, arcte accedit.

Frondes subsessiles, lineares, obtusæ, crenatæ, e medio ad basin sensim angustatæ, 12–15 lin. longæ, ½–1 lin. latæ, rigide coriaceæ, paleis subulatis brunneis patulis tenuiter vestitæ, costa tenui nigrescente, venis simplicibus erecto-patentibus, ad marginem haud productis. *Sori* alterni, globosi, uniseriati, superficiales, prope basin laminæ haud producti.

MADAGASCAR. Forest of Ambohimitombo, province of Tanala, alt. 1450–1560 ft., *Forsyth Major*, 477.

597. **Polypodium (Grammitis) tanalense,** *Baker* [Filices-Polypodiaceæ]; a *P. marginello*, Sw., frondibus haud nigro-marginatis recedit.

Rhizoma breviter repens. *Stipites* erecti, 9–12 lin. longi, pilis paucis patulis brunneis vestiti. *Frondes* simplices, lineares, integræ, 4–5 poll. longæ, 3–4 lin. latæ, rigide coriaceæ, utrinque glabræ, margine pilis paucis brunneis præditæ; venæ simplices, laxæ, erecto-patentes, parallelæ, perspicuæ, ad marginem haud productæ. *Sori* uniseriati, oblongi, ad venas terminales, inter costam et marginem mediales.

MADAGASCAR. Forest of Ambohimitombo, province of Tanala, *Forsyth Major*, 185.

598. **Polypodium (Eupolypodium) forsythianum,** *Baker* [Filices-Polypodiaceæ]; ad *P. khasyanum*, Hook., arcte accedit.

Rhizoma breviter repens. *Stipites* cæspitosi, brevissimi, paleis subulatis patulis brunneis vestiti. *Frondes* lanceolatæ, subcoriaceæ, elasticæ, 2–2½ poll. longæ, medio 5–6 lin. latæ, basin versus sensim angustatæ, utrinque virides, paleis subulatis brunneis patulis tenuiter vestitæ, ad alam costularem angustam pinnatifidæ. *Pinnæ* lineares, obtusæ, integræ, erecto-patentes, basi confluentes, centrales ½ lin. latæ; venæ immersæ, occultæ, erecto-patentes, bifurcatæ. *Sori* globosi, superficiales, inter costam et marginem pinnarum uniseriati.

MADAGASCAR. Forest of Ambohimitombo, province of Tanala, alt. 1450–1560 ft., *Forsyth Major*, 200.

599. **Acrostichum (Elaphoglossum) subsessile,** *Baker* [Filices-Polypodiaceæ]; ad *A. flaccidum*, Fée, arcte accedit.

Rhizoma breviter repens, paleis parvis lanceolatis brevibus castaneis. *Frondes steriles* contiguæ, subsessiles vel breviter stipitatæ, lanceolatæ, subpedales, medio 9–12 lin. latæ, rigide coriaceæ, nudæ, e medio ad apicem acutum et basin sensim angustatæ; venæ laxæ, erecto-patentes, perspicuæ, simplices vel furcatæ. *Frondes fertiles* ignotæ.

MADAGASCAR. Forest of Ambohimitombo, province of Tanala, *Forsyth Major*, 204.

MISCELLANEOUS NOTES.

King of Siam.—A private visit to the Royal Gardens was paid on the morning of Sunday, August 1st, by H.M. the King of Siam.

Botanical Magazine for July.—The number opens with a figure of *Zamia obliqua*, which has been in cultivation at Kew since 1880, when a plant was procured from Mr. Bull, of Chelsea. It is native of New Grenada. *Cattleya elongata*, the beautiful *Polygonum baldschuanicum* (the flowers of which are coloured too pink), *Helianthus tuberosus*, and *Lissochilus milanjianus* are also figured. The *Cattleya* is a handsome species from Brazil with large flowers having orange-coloured sepals and petals and rose-coloured labellum. It flowered at Kew in October, 1893. The *Polygonum*, native of Bokhara, is a valuable addition to the number of good hardy climbers. The Kew plant was received from the Jardin des Plantes, Paris. The specimen of the wild form of *Helianthus tuberosus*, was furnished by the Rev. C. Wolley Dod, who had grown it from indigenous tubers. The plate is accompanied by many interesting facts relating to the plant's history. The *Lissochilus* is, as its specific name implies, native of Central Africa. The flowers figured were sent to Kew by Mr. P. F. Garnett, of South Bank, Liverpool, while the bulb and leaves were drawn from a Kew plant which was received from the late Mr. John Buchanan.

Botanical Magazine for August.—The following plants are figured :—*Lycoris squamigera*, *Gasteria fusco-punctata*, *Dendrobium denudans*, *Ficus erecta*, var. *Sieboldii* and *Cynorchis purpurascens*—all from specimens cultivated at Kew. *Lycoris squamigera*, a native of China and Japan, is interesting as a showy plant used by the people of the latter country to decorate their cemeteries. *Gasteria fusco-punctata* is conspicuous for its much-branched inflorescence. *Dendrobium denudans* is a slender epiphyte of the Himalayas, whence specimens collected off oak-trees were sent to Kew by J. F. Duthie, Esq., and flowered in 1896. *Ficus erecta*, var. *Sieboldii* was sent to Kew by the late Dr. Schomburgk ; it is a native of Eastern Asia. The last figure is that of a Mascarene orchid with an extremely complicated flower : like the majority of the orchids of that region it is of terrestrial habit.

New Edition of Key Plan.—A fourth edition of this skeleton guide to the Royal Gardens was put on sale during the month of August. It has been carefully revised so as to include all recent improvements. The size has been somewhat reduced so as to make it more convenient for the pocket. The printing leaves something to desire in the matter of clearness, a rougher paper having been unfortunately used by the Stationery Office.

Water Lily Pond.—South of the lake in the Pinetum is a small pond which has long been dry. The bottom has now been puddled with clay and made water-tight. It is supplied with condensed water from the steam-engines at the waterworks. As the temperature of this is fairly warm it is hoped by this means to be able to cultivate in the open air many tender aquatics. This has already proved successful with the red *Nymphæa Lotus*, of India, and with *Thalia dealbata* and some other plants. It is intended also to plant out the fine coloured water lilies raised by Mons. Latour-Marliac, which are an addition to modern open-air gardening, as notable as they are delightful.

Tampico Jalap.—Ordinary Jalap, the "Purgo macho" of the Mexicans, is widely known as a medicinal substance, and the plant (*Ipomoea Purga*, Hayne), with purplish-pink flowers, is met with under cultivation not only in greenhouses in Europe, but to some extent as a field crop in the neighbourhood of the Cinchona Plantations, in the Nilgiris (Madras), and the Blue Mountains, Jamaica. Tampico Jalap, on the other hand, which has made its appearance in trade of recent years in considerable quantity, is produced by a different plant (*Ipomoea simulans*, Hanbury). It is stated to grow along the mountain ranges of the Sierra Gorda, in the neighbourhood of St. Luis de la Paz, from which town and the adjacent villages the roots are carried to Tampico, and thence shipped abroad. As Tampico Jalap was not represented amongst the plants in the Economic Collections at Kew, an effort was made to obtain a few tubers through the Foreign Office, who enlisted the kind co-operation of Her Majesty's Minister in Mexico. In November last, two lots of tubers were received in excellent condition from Her Majesty's Consul at Vera Cruz, labelled respectively "Tlacolulam" and "Tonayan," and described as having been obtained from these localities, "in the canton of Jalapa, in the state of Vera Cruz." The Tlacolulam tubers were distributed to the botanical departments at Jamaica and the Nilgiris, and to the botanic gardens at Oxford, Cambridge, Edinburgh, Glasgow, Glasnevin, and Trinity College, Dublin. The Tonayan tubers (a small lot) were distributed to Jamaica and the Nilgiris only. It was at once noticed that both these tubers were not obtained from the locality where Tampico Jalap is collected, and now there is little doubt that they are ordinary Jalap (*Ipomoea Purga*). This fact should be carefully noted by the recipients. In the meantime another effort is being made to obtain the tubers of the true Tampico Jalap

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ROYAL GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 130.] OCTOBER. [1897.

DLXXVII.—BOTANIC STATION, SIERRA LEONE.

(With Plan.)

The settlement of Sierra Leone at one time consisted only of the peninsula terminating in Cape Sierra Leone, with an area of about 300 square miles. The Colony with its protectorate now includes a large extent of country, estimated at 4,000 square miles, or a little more than one-half the size of Wales. The capital, Freetown, lying about 4 miles up the Sierra Leone river, at the foot of a chain of hills rising from 1,700 to over 3,000 ft., contains 30,000 inhabitants, and possesses the best harbour in West Africa. It is an important coaling station and a commercial entrepôt.

The scenery of Sierra Leone is said to be very similar to that of the West Indies. The soil is fertile and there is an abundance of pure fresh water. Tropical fruits grow luxuriantly. These are described in the *Kew Bulletin* for 1888 (pp. 221–223). Pine-apples especially are produced very abundantly, while bananas, plantains, avocado pears, mangoes, limes and oranges are not only consumed locally, but are also exported to the Gambia, Goree, and Senegal.

As stated in a letter addressed by Kew to the Colonial Office, September 4, 1886, "from a scientific point of view the natural botanical productions of Sierra Leone are of extraordinary interest. Early in this century a limited number of specimens found their way into European herbaria, and show that the flora is exceptionally rich."

A very interesting work in the Library at Kew is entitled "Substance of the Report delivered by the Court of Directors of the Sierra Leone Company to the General Court of Proprietors on Thursday the 27th March, 1794." To this is attached an appendix, in which "the Directors thought proper to introduce an account of the natural productions of Sierra Leone, being the substance of two Reports made to them by Mr. Afzelius, their botanist." It is evident that more than a hundred years ago a good deal was being done to establish a successful colony in this part of West Africa. Amongst the economic plants described are rice, cassava, yams, sweet potatos, ground-nuts, eddoes, oil-palm, plantains and bananas, papaw, guava, orange and lime trees,

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pumpkins, water melon, pine-apple, pigeon pea, maize, millet, cacao, cashew nuts, okras, sugar cane, butter and tallow tree, tamarind, fig-tree, hog-plum, country plum, country grapes, sorrel, "caleelos" (spinach), mammee apple, cainito, bumelia, and icaco or pigeon plum, (from the West Indies), country cherries, bread fruit, cream fruit, cola, castor oil, "cassia of the cane," indigo, cotton, silk cotton.

"Some account of the native and introduced fruits of Sierra Leone" was published by Mr. Joseph Sabine, F.R.S., from information obtained from Mr. George Don, A.L.S., in the *Transactions of the Horticultural Society* (vol. v., 1824, pp. 439–466). This gives a very interesting account of the principal plants yielding edible fruits in West Africa, with an excellent coloured plate of the Negro Peach (*Sarcocephalus esculentus*). There are also notes on the Butter and Tallow tree (*Pentadesma butyracea*) and the Kola (*Cola acuminata*). Of the common pine-apples, even in 1824, it is stated that "they are so abundant in the woods as to obstruct the passage through them in every direction; they grow vigorously and bear fruit abundantly." The other fruits already introduced and flourishing in Sierra Leone in 1824 were bananas, plantains, cocoa-nuts, papaw, oranges, lemons, limes, cashew, rose-apple, tamarind, melons, and tomatos.

A small but interesting collection of the economic plants from Sierra Leone was presented to Kew by Mr. G. H. Garrett, a travelling commissioner, in 1891. In 1892 Mr. G. F. Scott-Elliot, F.L.S., who was attached as botanist to the Delimitation Commission of the Anglo-French frontier, forwarded to Kew 500 species of dried plants in excellent condition, and also seeds of various kinds (*K. B.*, 1892, p. 72). In the following year (1893) Mr. Scott-Elliot and Miss Catharine A. Raisin prepared Reports on the Botany and Geology of Sierra Leone (*Colonial Reports*, Miscellaneous, No. 3, Sierra Leone, 1893. *See* also *K. B.*, 1893, pp. 167–169). To the former is attached a useful list and index of native names.

"The Botanical results of the Sierra Leone Boundary Commission" formed the subject of a paper contributed by Mr. Scott-Elliot to the Linnean Society (*Journ. Linn. Soc.*, xxx., pp. 64–100).

Plants supposed to belong to a species of *Coffea* raised from seeds collected by Mr. Scott-Elliot in Sierra Leone were distributed from Kew in 1893. On further examination, these plants having developed spines, which *Coffea* never has, were believed to belong either to species of *Randia* or *Canthium* (*K. B.*, 1894, p. 79).

One of the most interesting of the economic plants of Sierra Leone is the highland or native coffee (*Coffea stenophylla*) which, though discovered about a century ago by Afzelius, was not described until 1834, and was not introduced into this country until sixty years afterwards (1894). It was figured in the *Botanical Magazine* (t. 7475), and described more recently in the *Kew Bulletin* (1896, pp. 189–191). This coffee has been widely distributed from Kew. It has lately flowered in the West Indies, and is there regarded as likely to prove useful for cultivation in lowlands where the Arabian coffee will not grow.

Another promising economic plant in Sierra Leone is the native

cotton, probably *Gossypium herbaceum*, L. In order to supplement this an effort was made some years ago to introduce the cultivation of the Egyptian cotton in the colony. The following letter affords particulars on these points :—

ROYAL GARDENS, KEW, to COLONIAL OFFICE.

Royal Gardens, Kew,
21st January, 1893.

SIR,

I am desired by Mr. Thiselton-Dyer to acknowledge the receipt of your letter of the 2nd instant forwarding a copy of a despatch from the Governor of Sierra Leone regarding the experiments made in the colony to cultivate Egyptian cotton.

2. Mr. Thiselton-Dyer has noticed with regret that these experiments have not proved successful in Sierra Leone, and that the Governor does not consider that there would be any good in forwarding more seeds to the colony.

3. It will be within your recollection that in 1890, at the request of the Government of Sierra Leone, Kew undertook to obtain a commercial valuation and report on samples of native cotton collected in Mafweh on the Bum River ; and in my letter of the 9th May, 1890, a copy of a very favourable report furnished by the Manchester Chambers of Commerce was enclosed.

4. The Sierra Leone cotton was stated to be of good quality, and valued at sixpence per pound in Liverpool. There was said to be a good demand for it, and Lancashire buyers "would gladly welcome a very much larger supply than is now available." A copy of the correspondence was afterwards published as a Government notice (No. 56, dated the 26th May, 1890) in the local gazette, and the Governor, Sir James Hay, K.C.M.G., invited "the special attention of the public to the importance of the subject."

5. It was evident that a very favourable opening existed in the Colony of Sierra Leone for extending a valuable industry. There are few West African products in the present day that offer a remunerative market. Hence this subject of cotton-growing was of peculiar importance.

6. It was thought desirable not only to encourage and extend the cultivation of the cotton already in the hands of the natives, but to introduce the more valuable Egyptian cotton, which is in great demand "for the length, firmness, and strength of the staple."

7. If owing to local circumstances the cultivation of Egyptian cotton is not practicable in Sierra Leone, it may at least be possible to extend the growth and export of the ordinary cotton. If the colony could afford to support a small botanical station in the neighbourhood of Freetown, there is little doubt that many new industries could be started that are now believed impossible. The success attained at the two stations already established in West Africa at Lagos and Aburi show that they fulfil a most useful mission in regard to developing local industries.

I am, etc.,

(Signed) D. MORRIS.

The Hon. R. H. Meade, C.B.
Colonial Office.

As the result of the conference held at the Colonial Office with the four West African Governors on the 12th September, 1893 (*Kew Bulletin*, 1893, pp. 363—365), a successful effort to start a Botanic Station in Sierra Leone was made by Colonel Cardew, C.M.G., in the following year. The subjoined correspondence indicates the steps taken to attain that object.

COLONIAL OFFICE TO ROYAL GARDENS, KEW.

Downing Street,
10th September, 1894.

SIR,

I AM directed by the Marquess of Ripon to transmit to you a copy of a despatch from the officer administering the government of Sierra Leone submitting a scheme for promoting agricultural industry in that colony, and I am to say that his lordship would be much obliged if you would favour him with your observations and opinion with regard to Colonel Cardew's proposals.

I am, &c.,
(Signed) JOHN BRAMSTON.

The Director,
Royal Gardens, Kew.

Government House,
Freetown, Sierra Leone,
9th August, 1894.

MY LORD MARQUESS,

I HAVE the honour to submit for your lordship's approval, and strongly recommend for adoption as soon as feasible, a scheme for promoting agricultural industry in this colony which the Hon. Samuel Lewis, C.M.G., has been good enough to draw up at my instance.

2. I attach a copy of the scheme. It would embrace the establishment of a botanic garden, machinery for the proper preparation of coffee and cocoa for the market, a coffee plantation, industrial farming and annual agricultural shows.

3. In view of the fact that there is now no longer any possibility of extending our protectorate, as it is hemmed in by French territory on the one side and Liberia on the other, and that therefore there is a limit to the area from which produce can be obtained, especially since the restrictions that have been imposed by the French on produce coming from the far interior, that is, from beyond the limits of our protectorate, crossing our frontier, I think it is obvious that it behoves this government to use every effort to promote agricultural industry so that the products of the land, to which alone it is reduced for its source of revenue, may be increased to their utmost capacity, not only in the colony itself, but also in the protectorate. I therefore laid Mr. Lewis' scheme before the Executive Council, at a meeting held yesterday, when the general lines of it were unanimously adopted.

4. The Council did not discuss the details of the whole scheme, as they thought that might be done better by a committee, but with a view of arriving at an estimate of the expense that would be involved by its adoption they confined themselves to the consideration of the details necessary for its initiation and

working, and with their concurrence I beg to request that your lordship may be pleased to sanction a vote on the Supplementary Estimate for £950, which would represent the initial expense of the adoption of the scheme, including the purchase of land, plant, &c., and another for £220, which would be about the proportionate annual expense for the three concluding months of this year, about the commencement of which period I hope the scheme may be introduced.

6. Turning to the consideration of the different items.

Initial Expenses.—A very suitable piece of land on the Pademba road, known as the French Company's farm, is for sale; I have visited it with Mr. Lewis; it seems well adapted for our purpose in every way. It has a picturesque site, a fine stream running through it, a good sized house on it which would do as quarters for the curator and the overseer, and some other buildings for the labourers if necessary, and a plantation, in which I am informed there is about 7,000 coffee trees, and adjoining it there is land which could be acquired if necessary at easy rates.

I have not been able to obtain as yet the exact acreage of the property, but it is, I believe, about 50, and therefore quite sufficient for present purposes. I have requested the French Company to give this government the refusal of the property, pending reference to your lordship, and this they have consented to do; in the meantime, the Acting Queen's Advocate and the officer in charge of the Survey Department, will obtain all the necessary information regarding title deeds, plans &c. I may mention that it is considered that this property is being offered on very cheap terms, and I may add that Mr. Crowther, who is the Curator of the Botanic Garden at Accra, when he visited this colony in March last, in compliance with your lordship's instructions, inspected it and reported favourably on it for a botanic garden and industrial farm.

Having in view our object, viz., the promotion of agricultural industry, the establishment of machinery for preparing the coffee berry for the market is one of the most promising proposals in the scheme. At present the berry is so bruised and broken by the crude methods employed by the native cultivators that it does not command the best prices; it is hoped that when the cultivators find they can get their coffee prepared at a cheap rate, and by doing so obtain a higher market price than by their own methods of cleaning, that they will be induced to plant more trees and that others will commence the industry.

8. I trust that I have sufficiently demonstrated to your lordship that there are good reasons for the adoption of a scheme on lines similar to that proposed by Mr. Lewis, and I may add that with a view of obtaining public opinion as to its details I have given instructions for it to be published in the *Royal Gazette*.

I have, &c.,

(Signed) F. CARDEW,

Administrator.

The Right Honourable
The Marquess of Ripon, K.G., &c., &c., &c.

[Enclosure.]

Oxford Street, Freetown,
31st July, 1894.

SIR,

WITH reference to the question which your Excellency proposed for my consideration as to the best measures to adopt for promoting agricultural industry in this colony, I have the honour to submit the following statement of my views.

2. During the last few years, owing no doubt to keener competition in trade and the diminution of profits, public attention has been much directed to the subject of agriculture, and a few efforts, more or less extensive, have been made to give practical effect to the new-born idea. Judging from attempts that I have myself made in the same direction, I have good ground for saying that there exists in the colony great ignorance of the conditions for a successful and profitable prosecution of agricultural enterprise, especially in the presence of intelligent competition abroad.

3. It is a matter of vital importance to the prosperity of the colony that steps should be taken, even at some cost, to give a right direction to the awakened impulse in favour of agriculture, and to prevent it from being succeeded by disappointment and reaction.

4. One of the points in which it is felt such direction may be advantageously given relates to the mode of preparation for market of produce, especially those exported to European and American markets. It was suggested whether in respect, at least, of the small growers, their produce might not be bought, prepared and dealt with by the government. This suggestion involves a trading by the government under circumstances in which it will come in competition with private enterprise. I think if the government should seek to carry out this suggestion, it will hinder rather than encourage the very enterprise which it is its special object to promote.

5. The Board of Education has passed a resolution not long ago, agreeing with the view, that the establishment of a botanical station in this colony should be utilized for giving and extending practical knowledge in the art of agriculture. The nature of the knowledge generally lacking is twofold, viz.:—how to cultivate the produce, and how to prepare it properly for market. The botanic station, if established, can be so arranged that, within a moderate area, it might annex to itself the work of a farm for the cultivation of a few of the main products, such as coffee and cacao, to which attention is being directed by the people here. A correct principle practised in the cultivation of one or two plants can in course of time be easily adapted by the planters themselves to others; so that it will, according to my view, not be necessary to make at the botanic station a farm for every one of the commercial products to be grown in the colony.

6. For sometime to come coffee in particular, and cacao and cola in a less degree, will be the chief articles cultivated in the colony; and there is already evidence of some activity in coffee growing. At the same time, there are evident to those who have any practical knowledge of the proper cultivation of fruit trees, such as the coffee, grave errors in the method adopted in the cultivation here.

7. What is in the first place required is, that the intending or actual farmer shall have some object lesson for guiding his own operation, and the opportunity of knowing the reason for adopting any specific method in farming. A few minutes of practical directions from Mr. W. Crowther, the Curator of the Government Botanical Station at the Gold Coast Colony, on his recent visit to Sierra Leone, enabled me better than months of previous reading to understand and apply the principles of pruning the coffee tree.

8. Public notice given of the time for performing certain agricultural operations at the botanical station will secure the attendance of those who desire to profit by the knowledge of these operations. It should be a part of the duty of the curator to give such notice, and to invite inspection. Thus the preparation of the ground for, and the laying of nurseries, the transplanting, pruning, mulching and shading of trees, the harvesting and curing of produce, and even the rotation of crops, may, to a great extent, be learnt by observation. At present, very few of our so-called farmers have any intelligent idea of processes so essential to the cultivation of their produce. Hence, independently of the preparation of crops for market, our colonial products are generally inferior in quality to those of foreign growth.

9. The use of implements other than the short-handled hoe and the cutlass, which constitute the whole of the farmer's tools in Sierra Leone, may be encouraged and taught by proper practice at the botanical station.

10. The next defect in our agricultural system is the generally bad or indifferent preparation of produce for the market. In cases even as in that of ginger, wherein nature seems to favour us with a good article, the preparation largely discounts the value in foreign markets.

11. The fear is naturally to be entertained that, with the extended cultivation which is going on in the colony of coffee leading to a large export, defective preparation will soon fix in foreign markets a low standard for Sierra Leone coffee.

12. The process in use for cleaning coffee in the colony is the crude one of drying the berry and afterwards pounding it in a mortar and winnowing by hand with a fan. Besides the deterioration of the quality of the bean caused by drying the berry, the pounding breaks the bean and rarely secures that evenness in the colour which complete removal of the silver skin will effect. Hence a sample of perfectly good coffee of the same natural quality and colour will have a motley appearance, in consequence of much of the silver skin remaining on the bean.

13. Then the value of the sample also depends on the uniformity in the size of the beans. The Liberian coffee, which is the quality now being largely grown in Sierra Leone, varies very much in size. Our farmers do not, as a rule, know that it will be an advantage to them to secure the uniformity I refer to. Even if they do, they will require some other process than hand-picking to secure it, otherwise the labour will be too great and prove unremunerative.

14. In two ways assistance of great value may be given by the government. For many years to come coffee, as I have already observed, will be the product that will command serious attention

in the colony. I would, therefore, recommend that the government have in connection with the botanical station a few acres under coffee cultivation. If it should be decided to purchase the French Company's coffee farm at Pademba Road, my proposal could be more readily carried out. In such a coffee farm the proper machinery, sufficient for a small farm of fifty acres, should be established for working the coffee on the station. Opportunity should be given to farmers and others who are desirous of availing themselves of it, to inspect the machinery and see how it works. Some hand machines also should be used even if it were decided to work some by power.

15. There is no machinery now imported into the colony ; and though some growers may be able and willing to procure it after seeing and understanding its use, they will act unwisely to get now what may prove to be mere white elephants in their hands.

16. The machinery required for coffee consists of pulper, peeler and sizer. Their prices vary. I have an estimate, recently submitted to me, showing that for a farm of 600 acres, the cost would be about £460, in addition to that of the motive power, water, or steam. Single pulpers are quoted as low as £20 deliverable in London. This estimate is from a Ceylon firm (Messrs. Walker, Sons & Co., Limited), who profess to have invented the best pulper for Liberian coffee. A London firm of John Gordon supplies machinery, but I do not know if their pulper is specially adapted to the Liberian coffee. American machines appear to be cheaper.

17. As some or all of the machinery above-mentioned may not be within the means of small growers, it will be an advantage to them and encourage larger cultivation among this class, if the botanical station undertake at a reasonable cost the work of cleaning the produce which may be taken to the station for that purpose. This arrangement, it is hoped, will find for the machinery and the men employed in working it, the full employment which the limited production of the station may not give, and it will help to repay the cost of its purchase and maintenance.

18. Cacao grown even in fairly large quantities does not entail much cost in preparation, for which no machinery is required. A curing establishment is all that is necessary. Mr. Crowther, in his report on his recent visit to the West Indies, says (in page 19) that the cost of the buildings needed for this purpose for a farm of 300 acres need not exceed £160. If eventually the suggestion with respect to providing the means for instructing the public as to the best mode of preparing coffee be extended to cacao, the additional cost will be comparatively small.

19. A third plan that I would suggest for encouraging agriculture is the establishment of annual shows, in which prizes are to be awarded for competition in different departments of agricultural labour, for articles and objects produced or maintained in the colony.

20. Before stating the plan in detail, I may mention that one of its objects is to direct enterprise to other channels than coffee and cacao, in order to avoid the danger of throwing all the economic egg of the colony in one basket.

21. My proposal is that the shows shall be under the patronage of the government, but directed by a committee of which the

Curator of the Government Botanical Station shall be a member; and that sub-committees in different parts of the colony, of which the District Commissioners are to be members, be formed for aiding the committee.

22. The shows are to be held in Freetown in December or January, this season being about crop time for most of our produce.

23. The articles exhibited are to include representations of all kinds of agricultural produce, in the natural as well as manufactured state, botanical specimens, and live stock. It is suggested that exhibitors of farm produce shall be the producers or their agents, and not mere collectors.

24. Between the months of July and October next before the show, every intending exhibitor of farm produce should send in to the committee a notice of his intention to exhibit, and give reasonable satisfaction that produce at the show comes from his farm. Provision should be made for the inspection in November of every farm which or the produce from which it is intended shall compete.

* * * * * * *

32. Though the shows may be open for all kinds of produce, whether coming from owners beyond the colony, I would suggest that only farmers and inhabitants within the colony should be entitled to compete for prizes.

I have, &c.,
(Signed) SAML. LEWIS.

His Excellency Colonel F. Cardew, C.M.G.,
Administrator of the Government
of the Colony of Sierra Leone.

THE ADMINISTRATOR OF SIERRA LEONE TO THE COLONIAL OFFICE.

Sierra Leone,
21st November, 1894.

MY LORD MARQUESS,

I HAVE the honour to acknowledge the receipt of your lordship's despatch, No. 201 of the 18th of September last, on the subject of a scheme for the promotion of agricultural industry in this colony and to inform your lordship that the French Company's farm fulfils the requirements specified in the letter from Kew, that it was favourably reported on by Mr. Crowther, the Curator of the Gold Coast Colony, on the occasion of his visit to this colony in April last, and that I am now concluding the purchase of the property.

2. With respect to a curator and overseer, provision has been made in the estimates for 1895 which have been passed for salaries from £200 and £80 respectively for these officials, but I gather from the letter from Kew, that the latter, if a black man from the West Indies, would require about £150 to £180 a year, and if so a curator should in due proportion be paid a salary at least from about £200 to £250, rising by annual increment of £10.

3. In view of the recommendation in paragraph 3 of the letter from Kew and the suggestion of your lordship that I should apply to Jamaica for an overseer, I propose doing so by the next

opportunity and offering a salary of £150, and with reference to the engagement of a curator, I beg to request that your lordship may be pleased to direct that a man be selected from Kew for the office and ordered to proceed here as soon as convenient on the usual conditions. His salary to be from £200 to £250 by £10 yearly, with quarters and hammock allowance at 2*s.* 6*d.* per diem.

4. As machinery for the purpose of preparing the coffee berry for the market will be required as soon as the Botanic station is established, it is very desirable that the man to be selected should obtain all the necessary information regarding it, from what firms it can best be procured and the kind best adapted for this colony.

5. Your lordship will observe that the estimates for 1895, which I propose to forward for your approval shortly, do not sufficiently provide for the salaries of curator and overseer at the increased rate which I now suggest, but as the excess of estimated revenue over expenditure amounts to £1,101 there is ample margin for the small additional sum required to meet the increased salaries.

I have, &c.,
(Signed) F. CARDEW,
Administrator.

The Most Honourable,
The Marquess of Ripon, K.G., &c.

Mr. F. E. Willey, a member of the staff of the Royal Gardens, who had previously acted temporarily as curator of the Botanic Station at the Gold Coast, was appointed curator of the new station. He embarked for Sierra Leone in November, 1895.

The following letter gives an interesting account of his first impressions of botanical work in the colony.

CURATOR, BOTANIC STATION, SIERRA LEONE, TO ROYAL GARDENS, KEW.

Botanical Station, Freetown,
4th April, 1896.

SIR,

I HAVE the honour to forward by this mail steamer, a box containing seeds of *Pentadesma butyracea*, the butter and tallow tree of Sierra Leone,* tubers of *Amorphophallus leonensis*, bulbs of two species of *Crinum* (one *C. yuccæflorum*) and one *Hymenocallis;* also two samples of coffee in parchment, viz., *Coffea liberica*, and *C. stenophylla*, and two fibres which I extracted, one from *Sansevieria guineensis*, and the other from *Hibiscus* sp.; all of which I hope will arrive in good condition.

I am going to procure a quantity of seeds of the "butter tree," for an experiment as to their oil value, as suggested in your letter of January 13th last, to the Colonial Office.

The samples of coffee, and fibre which I have forwarded, I

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* An account of this interesting tree and its produce will be found on pp. 320–325.

prepared last January for the Agricultural Exhibition. I should be pleased to hear your opinion on them, and any suggestions you might be able to add for my guidance.

I arrived here on December 2nd last, and have ever since been very busy, first with clearing the land which was in a most dreadfully tangled state, in fact the coffee trees were completely hidden by weeds; and latterly I have been laying the place out.

I have about 35 or 36 acres of land altogether, in two pieces, each about 18 acres in extent; the lower piece on which is my house, is close to Freetown, about 250 feet above sea level; splendidly situated, and well watered; a stream running through the garden.

This piece I am laying out with a view to its being an ornamental, or pleasure garden to attract visitors, being so close to the town. The great drawback is the poorness, and shallowness of the soil, in fact from 3 to 4 acres of this lower piece are bare rock (laterite). I should like to get a foot or eighteen inches of good soil put on the top, but labour is scarce. I have only 14 men to work 35 acres, and carry out alterations. And again, the men are watering for four hours each day, it is so very dry, not a drop of rain from the time I arrived until last week, when we had about ½ inch.

I have started a fair sized nursery, and built a large plant house; also cleared several large pieces of land to plant when the rains come on. I have reconstructed, and made several roads, one of which is 700 feet long and 12 feet wide with an open drain on one side, and have just completed the main road which winds around from the entrance to the curator's house. This is 850 feet long and 20 feet wide. Now, I am very busy picking Liberian coffee, and pulping it, &c.

I shall be very glad when an overseer is appointed, so as to be relieved of some of the work, I cannot now give necessary attention to many things.

The Agricultural Exhibition which was held on January 23rd and 24th, was a great success for a first attempt. It will now be held annually. I exhibited samples of coffee, cacao, cotton, fibre, gums, &c., also the coffee machines which arrived a few days before and were erected in the hall; the two small ones (one for cleaning coffee in parchment and the dry cherry huller) were worked. I also prepared articles on the preparation of coffee and cacao, which were printed in leaflet form, and distributed.

Last month I had a few days' leave, and went to a large town called Port Loko, which is about 60 miles from Freetown on a tributary of the Roquelle River. The first part of the journey up the Roquelle was unattractive, owing to the great width of the river; however, after some 10 to 15 miles it could be seen that the banks were covered with mangrove trees, and over these the tallest of the inner vegetation could be seen, of which cocoa-nuts and the silk-cotton tree formed the principal features. About 20 miles up the Roquelle we branched off into the Port Loko River. The Roquelle from this point is called the Magbeli River, from the principal town on it, Magbeli, about 70 miles from Freetown. As we could only proceed with the tide, owing to its strong flow soon after entering the Port Loko River, we stopped at an island in the middle of the river called Kasanko. Here we

stayed the night at an European factory, where they buy the produce as it is brought down by the natives in their large canoes, this is principally palm-oil, palm-kernels, and rubber; also a little camwood, gum, ivory, gold, benniseed, and kola.

The next morning, as soon as the tide was favourable, we continued our journey, the river now narrowed in considerably, and a clear view could be obtained of both banks, which were fringed with the mangrove, broken here and there by little creeks, many only a few yards wide, at the end of which a glimpse could be obtained of a native village. Wherever a large break occurred, there was situated a small town, and it was at these places that the vegetation became interesting; *Elæis*, *Raphia*, *Phœnix*, and *Cocos* represented Palmæ; also conspicuous were Adansonias, *Cola*, mango, *Eriodendron*, *Acacia*, *Dialium*, *Pentadesma*, *Hibiscus*, cotton, *Mimosa*, *Tradescantia*, *Selaginella*, several ferns including some magnificent pieces of *Platycerium* (*æthiopicum*, I suppose), and a few orchids. Owing to its being towards the end of the dry season everything was nearly withered up, and hardly a plant was in flower.

During the second day's journey, we passed some very large alligators which were sleeping on the mud banks of the river. There were also some very fine birds, pelicans, cranes, herons, curlews, &c., and many small birds with very attractive plumage. We passed several troops of chattering monkeys, whose curiosity was instantly aroused on sighting us.

I was disappointed in the general appearance of Port Loko, and neighbourhood. The town is very large, but the land was not of such a fertile character as I expected; the bush was very scrubby. A little rice, and cassava, were cultivated in some places, but no other economic products were grown except by the missionary who had a few hundred coffee trees, and at one small town on the way up I noticed about 200 trees planted out, and several thousands seedlings in beds. I could not ascertain to whom they belonged.

I must tender you my best thanks for the seeds and publications which you have been so kind as to forward to me from time to time.

I hope to be able to send more things to Kew in a few months time, especially if I am fortunate enough to get a good overseer, as then I shall have time to look around, whereas, as I am situated at present, I have absolutely no time to spare.

I have, &c,
F. E. WILLEY,
Curator.

W. T. Thiselton-Dyer, Esq., C.M.G., C.I.E.

The samples of coffee referred to in the first paragraph of the preceding letter were submitted for valuation and report with the following result:—

MESSRS. LEWIS & PEAT TO ROYAL GARDENS, KEW.

6, Mincing Lane, London, E.C.,
4th May, 1896.

DEAR SIR,

YOUR favour of the 1st inst. with sample of coffee reached us this morning.

We have carefully examined same, and beg to report as follows.

The parchment is good, clean, and bright. It has been well prepared and well cured, and very hard dried.

The coffee comes out rather brownish and foxy coated, and is small in size for Liberian; possibly the drought has affected the coffee to a great extent, as you suggest.

To day's value is about 78*s.* to 80*s.* per cwt. if husked and sized here.

We are, dear Sir,

Yours faithfully,

(Signed) LEWIS & PEAT.

It is a very fair sample on the whole.

The report on the fibres was not so satisfactory.

"*Sansevieria guineensis.*—Fibre of good length but of bad colour. A somewhat similar sample from Trinidad was valued in 1886 at £20 per ton. Present prices would probably be much lower.

"The Hibiscus fibre is not suitable for commercial use in its present form."

Mr. James E. Hartley, a foreman at the Hope Botanic Gardens, Jamaica, was appointed overseer at the Botanic Station at Sierra Leone, under Mr. Willey, in September, 1896. He spent some time at Kew on his way from Jamaica to West Africa (*Kew Bulletin*, 1896, p. 218).

The duties of the overseer are to undertake the experimental cultivation of coffee, cacao and other economic plants, and to assist in training native boys in horticultural work.

The site selected for the Botanic Station at Sierra Leone consists of two pieces of land, one of which is shown in the accompanying plan prepared by the curator. This is the lower or north garden, about a mile from the centre of Freetown, at an elevation of 250 ft. above mean sea-level, and well sheltered from the prevailing winds. There is a perennial stream flowing through the gardens, and it is intended to tap this at a higher level, and lead the water in small rivulets or in pipes all over the ground.

The land is not yet properly fenced; it is in contemplation to erect a strong fence, with barbed wire and hard-wood or live posts, as soon as possible. A serviceable wooden gate, with stone pillars, has been placed at the entrance near the overseer's house.

The soil is not all equally good. It is described as rather poor and shallow in places, "while from 3 to 4 acres are covered with slab rock and laterite." There is, however, a sufficient area of good soil, especially along the banks of the stream, for nurseries and propagating grounds. Other parts are suitable for being laid out in lawns, and capable, by the addition of manure and soil, for growing specimen trees in specially prepared holes.

The other portion of the station is, unfortunately, not accessible from the lower garden. It is an isolated plot situated on a slope at an elevation of 600 ft. above the sea, and contains the remains

of a small coffee plantation. The trees are looked after and regularly weeded and pruned, but beyond this it is not possible to afford them further attention at present.

Further particulars are contained in the following letter received with the plan from the curator in January last :—

CURATOR, BOTANIC STATION, SIERRA LEONE, TO ROYAL GARDENS, KEW.

Botanic Station, Sierra Leone,
January 6th, 1897.

SIR,

I HAVE the honour to forward a rough plan of the lower or north portion of the station here. I trust it will give you an idea of the progress which has been made in laying out the garden during the last 12 months.

As I mentioned in my letter of some months ago, the ground is very poor and rocky and difficult to work, consequently the results are not very encouraging.

The nurseries have made fair progress. I have quantities of the Liberian and the native narrow-leaved coffee, also cacao, about 500 kola, and about 800 eucalyptus, growing well, many over two feet high, besides black pepper and many other economic and ornamental plants.

The rainfall this last year has been very heavy, nearly 200 inches. As I was not expecting such heavy rains, I was doubtful if the roads I had made would stand it, but I am glad to say they were not damaged in the least ; but the open drains at the sides were washed out to a depth of 3 to 4 feet in some places. These have now all been made up with stone, and stout stakes driven in at regular intervals to stop the rush of water, which is very great, the garden being on a slope.

I hope to have several apprentices at work here next month ; I want to see them fairly started at work before I go on leave.

I must thank you for assisting in the selection of such a capable man as Hartley as overseer. He has worked well so far and I find him a great help and very useful.

I am a member of the Agricultural Exhibition committee here, and also one of the judges in the farm and plantation competition. The inspection of the plantations and farms entered for competition will commence in a few days. It embraces the whole of the Sierra Leone peninsula and also Sherbro Island and neighbourhood. The Exhibition is on the 16th and 17th of February ; I am preparing samples of economic products for exhibition.

Messrs. Millen & Humphries were able to stop with me for several days on their way down the coast to their respective stations.

I have, &c.,
(Signed) F. E. WILLEY.

W. T. Thiselton-Dyer, Esq., C.M.G., C.I.E., F.R.S.,
Royal Gardens, Kew.

Mr. Willey has been on leave in this country during the present year, and in accordance with an arrangement made with the Colonial Office he and the Curator of the Gambia Botanic

Station have spent eight weeks at Kew in the study of African plants and products in the houses and museums connnected with this establishment, and in acquiring information in the city and elsewhere respecting the commercial value and method of treatment of subjects likely to be successfully remuneratively taken up in West Africa.

DLXXVIII.—IMPROVEMENT OF THE SUGAR-BEET AND SUGAR-CANE.

It is not sufficiently recognised that the development of the vast industry which has been founded on the beet has been only possible in consequence of the progressive increase in the yield of sugar. This has been obtained by gradual and progressive selection.

In order to obtain exact information on the subject application was made to Mons. H. L. de Vilmorin, who has had a large share in bringing the sugar beet to its present condition as a commercial source of sugar. The following interesting letter was received in reply. It gives a striking picture of what can be accomplished by persistent selection.

MONS. H. L. DE VILMORIN to ROYAL GARDENS, KEW.

17, Rue de Bellechasse, Paris,
December 30th, 1896.

DEAR MR. THISELTON-DYER,

I can very easily send you the desired information, as the subject of sugar-beet is one to which my father and myself devoted much time and attention.

Both the beet-root and the leaf-beet are derived from *Beta maritima*, L., a native of the shores of the Mediterranean and of the western coasts of Europe. It was known to the ancient Greeks and Romans under both garden forms.

In the eighteenth century large varieties of the beet-root were transferred from the garden to the field, used as food for cattle, first in Germany, afterward in France and in Great Britain.

When Achard initiated the manufacture of sugar from beet-root the white field variety was judged the most suitable for sugar-making; it contained 8 to 10 per cent. of its weight in pure sugar. Selection was then brought to bear on the existing variety, and in fifty years slightly increased the percentage of sugar, raising it to 12 or 13 per cent. (of the gross weight of the root). After 1850 more accurate means of ascertaining the amount of sugar in each individual root were introduced by my father, and in a dozen years a race was established yielding 16 and even 18 per cent. of sugar. The fibrous tissues of the root which hold most sugar had been developed and the cellular tissues reduced to the utmost extent; hence the root became small, hard, dry and easily deformed. Ever since the object has been to unite a better shape with an equal amount of sugar. Beet-roots containing more than 18 per cent. sugar cease to vegetate properly and die.

I take the liberty to send a copy of a lecture delivered during the 1889 Exposition. The sugar-beet is touched on at pp. 22

et seq. You will see that it is an exaggeration to say that the quality has been enormously increased ; but it was so in a fairly large measure ; and this has raised beet-sugar making from a bad job into a prosperous industry.

I am, &c.,
(Signed) H. L. de Vilmorin.

In this case improvement was effected by taking advantage of seminal variation. The same method might be applied to the sugar-cane now that seedlings are obtainable with tolerable facility. But progress would necessarily be made slower than in the case of the sugar-beet.

For this reason the method of chemical selection which has been practised in Louisiana seems both more practicable and more promising. It is fully described in the *Kew Bulletin* for 1894 (pp. 86–96).

The following report gives the result of a preliminary report made last year in Barbados :—

Extract from letter from Mr. J. R. Bovell, Curator, Botanic Station, Dodd's Reformatory, Barbados, to the Director, Royal Gardens, Kew, dated March 30th, 1897.

"When I was at Kew in 1894 you suggested to me the desirability of trying to increase the saccharine of the sugar-cane by chemical selection. On my return to Barbados at the end of 1894 it was rather late to start the experiment, but in December, 1895 a plot was planted with cuttings of the upper halves of canes that contained over the average amount of available sugar in the canes tested the first day. A second plot was planted with cuttings of the upper halves of those below the first day's average, and a third plot was at the same time planted in the usual way, *i.e.*, with cuttings taken indiscriminately from ordinarily well-grown canes. These plots were tested two weeks ago, and the results were very satisfactory. The canes grown from the cuttings taken from the richest canes gave the richest juice ; those from the canes lowest in sucrose the poorest juice, and those planted in the usual way coming about mid-way between the other two."

DLXXIX.—FOREST PRODUCTS OF SIERRA LEONE.

The following interesting account of the forest products of Sierra Leone and their possible development is taken from the *U.S. Consular Reports* for November, 1896 (pp. 442–444). It is an extract from an address made by the Governor of Sierra Leone (now Sir Frederic Cardew, K.C.M.G.) to the Legislative Council of Sierra Leone, on the 21st April, 1896.

Some portions of the forests described have been referred to in the report made by Mr. Scott-Elliot, already noticed in the *Kew Bulletin* (1893, p. 167–169) :—

There are large tracts of forests with abundance of rubber and valuable timber awaiting exportation. They have been in no

sense explored, and they only require intelligent and systematic methods for gathering the rubber to yield their wealth to the first comer who has the necessary enterprise.

For instance, the forest to which I have already referred as lying between Makali and Kruto may be roughly estimated to cover the greater portion of the district between the Seli river on the west and the Bagwe on the east, and an east and west line drawn through Kruto in the north, and a similar line drawn through Makali in the south.

This area comprises portions of the Kuniki and Koranko districts, and the extent of forest land within it may, on the most moderate calculation, be computed at about 600 square miles.

Along a great portion of the route taken by my party the forest is of some eight to ten years' growth, but in many parts of the district there is, I have no doubt, the virgin forest; but even in the forests of recent growth there is abundance of rubber, and three kinds of such plants were pointed out to me. Two were vines called, respectively, in the Timni language "lilibue" and "nofe," and the third a tree called in the same language "kewatia." The "lilibue" yields the choicest rubber in the protectorate. In gathering it, incisions are made in the bark of the vine, which is not, however, always cut down. In the case of the "nofe" vine it is invariably cut up into small pieces of about 6 inches in length, and thus completely destroyed. The "kewatia," *i.e.*, the rubber tree, appears to grow rapidly, and in eight or ten years to attain a girth of from 2 to 3 feet, but the tree, however, like the "nofe," is also destroyed in the process of gathering its rubber; it is felled, and the bark ringed at intervals of about 6 inches along the trunk. The rubber appears to be treated in a different way to that of the vines; the latter is, as you know, coagulated with lime juice, but the rubber which exudes from the rings cut in the tree is placed in hot water, on the surface of which it coagulates, and is then cut into strips, which are formed into balls for the market.

I have ventured, at the risk of being tedious, to go into detail in describing the manner in which the rubber is gathered.

I think we must all admit that the native processes are crude and wasteful in the extreme, and it is evident if more intelligent and economical methods were adopted, as I understand is the case in the Brazils and other parts of South America, there would be a far larger yield, and every probability that the West African rubber would command as high a price as South American. But if some steps are not taken to teach the natives better methods of extracting rubber than they now use, it may safely be predicted that with the increasing demand for rubber, in a few years the plant will become extinct, and an industry which should be one of the most thriving in the colony will be ruined.

In the forests I am speaking of the rubber is gathered by Susu traders in the crude and wasteful manner I have described. The natives in the Koranko and Kuniki districts, especially in the former, appear to be very ignorant of its value and the methods of gathering it. I feel quite convinced that if traders were to either go themselves or send as agents into these parts men well experienced in the industry, they would be rewarded for their trouble and expense with rich harvests.

The methods which prevailed in South America should be studied and adopted if found practicable here. A short account of the preparation of the Para rubber, which is the premier rubber of the world and is obtained from a large tree which forms extensive forests in the lowlands of the Amazon, was published at the recent Agricultural Exhibition, and the curator is now drawing up an account of other processes which may be suitable to the rubber industry of this colony.

The natives of the interior require to be trained in an intelligent way of working, not only in the preparation of rubber, but also in that of palm-oil. It is absurd to think that for the purpose of extracting a few ounces, or say, even pounds, of rubber, large trees should be felled, as is the case now, not to mention vines, and so completely destroyed. In the territory of the Amazon, each rubber tree is made to yield an annual crop, and the bark, instead of being ringed, has a number of incisions made in it as far up the trunk as the hand can reach, and the milk is caught in little hollowed-out lumps of clay which are placed below each incision. This work is done by the Indians, and there is no reason why the aborigines of the interior should not be taught to adopt similar methods. If the traders who purchase the rubber and other indigenous products would inform the Government in what direction they consider reforms should be introduced in the prevailing systems of gathering such produce, the Government would, I feel sure, lend an attentive ear to their suggestions.

The forests in the Kuniki and Koranko districts are, relatively speaking, very accessible from here ; Magbeli, from which place they can be entered, being distant about seven days' easy marching, and there is water carriage for light canoes from Benkia, two marches from Magbeli, down the Roquelle river.

But these forests are small compared to those on the Anglo-Liberian frontier, along the Morro and Mano rivers, which extend for 800 or 1,000 miles. Had it not been for the border raids which have been carried on for the last eighteen to twenty years, I have no doubt they would have been exploited long ago ; but there is an opportunity, now that the raiding has altogether ceased, for opening up these forests, which abound in rubber and elephants, and the southern portions of which are within two days' journey of Sulima.

DLXXX.—BUTTER AND TALLOW TREE OF SIERRA LEONE.

(*Pentadesma butyracea*, Don.)

This noble tree of West Africa is a member of the Gamboge order (*Guttiferæ*). It extends from Sierra Leone southward to the mouths of the Niger, and beyond to the equator. It sometimes attains a height of 70 ft. ; the large glossy leaves are from 5 to 10 in. long, the flowers are abundant, very handsome, and succeeded by a large, lemon-shaped brown berry, 6 in. long and 4 to 5 in. diameter, with one or two, or sometimes numerous, seeds. The plant was described by Sabine in the *Transactions of the Horticultural Society* (vol. v., 1824, p. 457) as the "Butter and Tallow tree." It has recently been figured in *Hooker's*

Icones Plantarum, pl. 2465 (1896), with a description by Professor Oliver. It is known in Sierra Leone as the "Kamoot" tree. Professor E. Heckel, in his monograph *Les Kolas Africains*, refers to it as the "Kanya" tree; and the oil or butter yielded by the seeds as *beurre de Kanya.*

The following correspondence relates to an investigation that has been carried on in this country at the request of the Government of Sierra Leone into the probable value of the seeds of this tree as a source of oil. The result, owing to the exceptionally depressed condition of the market for oil-seeds, is not very promising. It is possible, however, that the information now published may prove of service to those interested in West African products, and suggest means whereby the seeds may eventually become of commercial importance:—

THE COLONIAL SECRETARY, SIERRA LEONE, TO ROYAL GARDENS, KEW.

Colonial Secretariat, Sierra Leone,
18th December, 1895.

SIR,

I have the honour, by direction of His Excellency the Governor, to forward to you, through the Crown Agents for the Colonies, a case containing seed, flower and leaves of the "Kamoot" tree, and to request that you will be so kind as to report upon it as a plant worthy of cultivation from an economic point of view.

2. A copy of the letter of Rev. J. A. Cole, who furnished the specimens, is herewith enclosed for your information.

I have, &c.,
(Signed) J. C. GORE,
Colonial Secretary.

The Director,
Royal Gardens, Kew.

[Enclosure.]

Freetown, Sierra Leone,
November 25th, 1895.

DEAR SIR,

ACCORDING to arrangement made with His Excellency Governor Cardew, I beg to forward you a package containing the seed, flower and leaves of the Kamoot tree.

It is an economic plant that may be introduced into the commerce of Western Africa. It grows extensively all along the banks of our rivers, and on the mountains. The seed yields an edible oil, highly esteemed by the interior natives.

His Excellency Governor Cardew desires it to be examined by Kew, and I arranged with him that it be forwarded through the Government.

The seed now forwarded is not fresh, and the proportion of oil may not be estimated fairly from it, but it may be possible to arrive at something more definite when fresh seeds are obtained. At present it is the flowering season, and the sample of seed is fully a year old.

I remain, &c.,
(Signed) J. AUGUSTUS COLE,

The Honourable
The Colonial Secretary,
Freetown, Sierra Leone.

The Royal Gardens, Kew, to Colonial Office.

Royal Gardens, Kew,
January 13th, 1896.

Sir,

I have the honour to inform you of the receipt of a letter from the Sierra Leone Government of December 18th, advising the despatch of a case containing dried specimens and seeds of the Kamoot tree.

2. By means of the former we were at once able to identify it as *Pentadesma butyracea*, the "Butter and Tallow tree" of Sierra Leone, which was first described in the year 1824 by Mr. Joseph Sabine in the *Transactions of the Royal Horticultural Society*. He says "the yellow greasy juice . . . is given out copiously when the fruit is cut or opened, ... it is not, however, much used by the settlers on account of a strong turpentine flavour which belongs to it; this juice is more abundant in the seeds than in any other part of the fruit."

3. As far as I know the seeds have not been introduced into commerce as a source of oil. But I can see no reason why, as the tree is abundant in the colony, they should not be utilised. For this purpose the best plan would be to induce some oil-seed crusher at Liverpool to give them an experimental trial, and to consign to him a quantity sufficient for the purpose.

4. Probably Messrs. James Samuelson & Sons, Ltd., Scottish Chambers, 48 Castle Street, Liverpool, would be willing to take the matter in hand.

I have, etc.,
(Signed) W. T. Thiselton-Dyer,
Director.

The Hon. Sir Robert Meade, K.C.B.,
Colonial Office,
Downing Street, S.W.

Curator, Botanic Station, Sierra Leone, to Royal Gardens, Kew.

Botanical Station, Sierra Leone,
4th April, 1896.

Sir,

I have the honour to forward by this mail steamer, a box containing seeds of *Pentadesma butyracea*, the butter and tallow tree of Sierra Leone.

* * * * *

I am going to procure a further quantity of seeds of the "butter tree," for the experiment as to their oil value which you suggested in your letter of January 13th last, to the Colonial Office.

The native tribes around here all extract an oil from the seeds and use it for cooking in the same way as they do palm-oil. I have been informed by some natives that they prefer it to palm-oil on account of its better flavour. The season for the seeds is March and April. Then the natives prepare and store a sufficient quantity of the oil to last until the next season. The oil is

extracted by drying the seeds and parching them over a fire. They are then pounded in a mortar; water is added and the whole boiled over a fire, and the fat or oil is skimmed off as it rises.

* * * * *

I have, &c.,
(Signed) F. E. WILLEY,
Curator.

W. T. Thiselton-Dyer, Esq., C.M.G., &c.,
Director, Royal Gardens, Kew.

CURATOR, BOTANIC STATION, SIERRA LEONE, TO ROYAL GARDENS, KEW.

Botanic Station, Sierra Leone,
May 19th, 1896.

SIR,

I HAVE the honour to forward by the s.s. "Ilaro," two bags containing seeds of *Pentadesma butyracea*, the butter or tallow tree of Sierra Leone.

One bag contains 57 lbs. of dried seed, and the other 115 lbs. of fresh seed. Would you kindly have them experimented upon, to ascertain their value as a source of oil, as suggested in your letter to the Colonial Office, dated January 13th, 1896?

I don't think it is necessary for me to add more, as I explained about the tree and how the natives use it, &c., in my letter to Kew last month.

The seeds are sent to Kew because it is thought that they would receive more attention from the firm in Liverpool, than if the seed was sent direct from here.

I have, &c.,
F. E. WILLEY,
Curator.

W. T. Thiselton-Dyer, Esq., C.M.G., &c.,
Director, Royal Gardens, Kew.

ROYAL GARDENS, KEW, TO COLONIAL OFFICE.

Royal Gardens, Kew,
10th December, 1896.

SIR,

WITH reference to my letter of the 13th January last, I have the honour to inform you that a consignment of the seed of *Pentadesma butyracea*, the butter and tallow tree of Sierra Leone, was received from the Government of that colony in June last.

2. This seed was at once forwarded for investigation to Messrs. Samuelson & Sons, Ltd., of Liverpool, and the result is contained in the enclosures herewith.

3. The price of seed oils in this country at the present time is rather low and hence the estimated value of the tallow seeds stated by Messrs. Samuelson & Sons (to use their own words) "is hardly a fair one upon which to base calculations as to the real commercial value of the seeds."

4. Nevertheless the investigation has been a useful one and the thanks of the Government are due to Messrs. Samuelson & Sons for the trouble they have taken in the matter. We now know for the first time the percentage of oil in these seeds and the probable uses to which it can be applied.

I have, &c.,
(Signed) W. T. THISELTON-DYER,
Director.

The Hon. Sir Robert Meade, K.C.B.,
Colonial Office,
Downing Street, S.W.

[Enclosure 1.]

Messrs. SAMUELSON & SONS TO ROYAL GARDENS, KEW.

Scottish Chambers,
48, Castle Street, Liverpool,
23rd October, 1896.

DEAR SIR,

WITH reference to the investigation with the "butter and tallow" seeds received, we find they contain 41 per cent. of oil, of which we send you a small sample. Our investigations have hitherto only been in the laboratory, and the quantity supplied is not large enough for a practical test.

The oil, we think, would be suitable for soap-making; this we shall be able to ascertain in the course of a week or two, as we are getting one of our soap-making friends to try it. If it should be suitable for soap-making, and the refuse suitable for cattle foods, we think the price of the seeds ought to range from £8 to £10 per ton, delivered in England, according to the state of the market.

Yours truly,
(Signed) EDW. SAMUELSON.

The Director,
Royal Gardens, Kew.

[ENCLOSURE 2.]

Messrs. SAMUELSON & SONS TO ROYAL GARDENS, KEW.

Scottish Chambers,
48, Castle Street, Liverpool,
8th December, 1896.

DEAR SIR,

THE writer saw Mr. H. S. Timmis, of Messrs. Gossage & Sons, yesterday, and he reports that the oil made from the nuts of which you sent us two sacks, is (though not an oil of high quality) undoubtedly suitable for soap-making, and, so far as we can tell you, would probably fetch about £2 per ton less than palm-kernel or cocoa-nut oil. Both these oils are very low at present (very little over £20 per ton), and perhaps to-day's price is hardly a fair one to base any calculations on as to the commercial value of the nuts.

The cake we have not yet had a report upon; but as soon as we have, we will send it on to you. We do not think it can by any possibility be worth more than £3 per ton, which would to-day give the selling value of the nuts at a maximum of £6 per ton, delivered in Liverpool. Whether it would pay to import at this price we very much doubt, and from what we can see of the oil we think it would not be suitable for any other purpose than soap-making. It is not good enough for candle-making, and it is too dear for mixing with mineral oil to make a solid lubricant.

Any further information we get on the subject we shall at once send you.

Yours truly,
(Signed) EDW. SAMUELSON.

The Director,
Royal Gardens, Kew.

DLXXXI.—COFFEE CULTIVATION AT THE GOLD COAST.

The progress made in the cultivation of coffee at the Gold Coast has been noticed in the *Kew Bulletin* (1895, pp. 12, 21 and 165). In the *Blue Book Report* for the year 1893 (*Colonial Office Reports*, Annual Series, 1895, No. 136) the following account was given of the experiments carried on in connection with coffee and cacao at the Botanic Station at Aburi :—

"A good deal of general work has been done in the Government Botanical Station during the year and considerable attention has been paid to the plantations of coffee and cacao, in the cultivation of both of which, but more especially the former, the natives appear to have become interested. Along the road leading from the Botanical Station through the country of Akwapim to the interior are large numbers of small clearings in which coffee plants, chiefly obtained by purchase from the Botanic Station, are to be seen in a most flourishing condition. The Liberian coffee plant appears to thrive best, but there are large quantities also of the Arabian coffee plant, the berry of which, however, is small and apparently deteriorated. It will probably be necessary for the Government at no distant date, if the coffee industry is to be fostered into a trade, to instruct these native cultivators in the proper way of preparing the berry for export. At present the most primitive method is employed. The berries are scraped by hand with a round stone worked in the hollow of a larger stone, and after this process they are washed and dried in the sun. It is obvious that a large crop could not be so dealt with, and that the employment of machinery in the near future is imperative. The initiative will have to be taken by the Government, because of the general ignorance on the part of the natives of all machinery, even of the simplest character, and because no single native cultivator possesses sufficient capital, enterprise, or experience to take the matter in hand."

During the last two years the Government has introduced machinery for pulping and curing coffee, and consignments of both coffee and cacao have been forwarded through the Crown Agents for sale in the London market. This plan afforded the best means for

testing the commercial value of the produce, and it is gratifying to find that the result shows that coffee and cacao can be grown in West Africa capable of realising good prices in European markets. Much still remains to be done to induce the natives to cultivate and cure their produce in a satisfactory manner.

During the year 1896 there were shipped from the Aburi Botanic Station 30 bags of coffee and four bags of cacao. The return sales were as follows:—

CROWN AGENTS TO COLONIAL SECRETARY, GOLD COAST.

Downing Street, S.W.,
17th July, 1896.

SIR,

I HAVE the honour to inform you, with reference to your letter of the 15th April last, that we have caused the bags of coffee and cocoa sent home per s.s. "Cabenda" to be sold at the Commercial Sale Rooms, Mincing Lane, London, by a first class firm of colonial brokers, Messrs. Rucker & Bencraft, and the following has been the result :—

COFFEE.

The 26 bags marked L were examined, sorted, cleaned, husked, and then refilled into 15 bags, and were sold at the rate of 70/- per cwt.

The four bags marked A were similarly treated, refilled into two bags, and sold at the rate of 56/- per cwt.

	£	s.	d.
The net amount realised for the coffee was	55	10	0
COCOA.			
The four bags of cocoa were sold at the rate of 37/- per cwt., the net amount realised being	6	2	1
	61	12	1
The freight to Liverpool, and charges there, were	4	12	3
Net total realised ...	£56	19	10

I enclose, for the information and guidance of the Colonial Government, copies of the letters, reports and account sales which we have received from the brokers.

I have, &c.,
(Signed) E. E BLAKE.

[Enclosure.]

Me. srs. RUCKER & BENCRAFT TO CROWN AGENTS.

37, Mincing Lane, E.C.,
8th July, 1896.

GENTLEMEN,

THE four bags cocoa will be offered at public sale on Tuesday next.

Referring to the shipment of coffee and cocoa—

1st. We should recommend your friends to use stouter gunny for their bags.

2nd. To dry their Mocha seed coffee more before shipping it in husk.

3rd. To clean their Liberian coffee themselves before shipping, the husk being so heavy, and there being no colour to preserve.

Yours, &c.,

(Signed) J. A. RUCKER & BENCRAFT.

The shipments for the current year (1897) are described in the following corrrespondence :—

CURATOR, BOTANIC STATION, GOLD COAST, TO ROYAL GARDENS, KEW.

Aburi,

DEAR SIR, 13th June, 1897.

I HAVE taken the liberty of writing to inform you that the Botanic Station is now properly fenced in. It was completed on the 12th instant; there are two gates which are locked after 5 p.m.

The shipment of coffee and cacao for 1897 from this station is as follows :—

Liberian coffee, dried in parchment	...	46 sacks.
,, ,, cherry dried ...	...	8 ,,
Arabian ,, dried in parchment	...	5 ,,
Cacao	...	9 ,,
Total	...	68

This was sent off about the end of May, and with the exception of the five sacks of Arabian was harvested and prepared by myself.

I am, &c.

(Signed) C. H. HUMPHRIES.

The Director,
Royal Gardens, Kew.

MESSRS. RUCKER & BENCRAFT TO CROWN AGENTS.

37, Mincing Lane, E.C.

GENTLEMEN, 17th August, 1897.

WE have now the pleasure to enclose contract for eight bags cocoa ex "Bathurst" at 58/-.

The price is very satisfactory: there is at the moment a considerable speculation current in cocoa, and a few months ago such cocoa would only have realised about 40/- per cwt.

In a rising market common sorts always reap the greater advantage, in falling markets they suffer more than fine cocoas.

The outside appearance of this cocoa is fairly good, the break is too dark and often defective. The dark colour of the beans you may be able to remedy, they ought to be rosy in colour; the defective can certainly be got rid of by more careful curing.

We are, &c.,

(Signed) J. A. RUCKER & BENCRAFT.

ACCOUNT SALE of 8 bags cocoa, per "Bathurst" (s.) at Accra, sold by order and for account of the Crown Agents for the Colonies.

1897.
August 17th.

		c.	qrs.	lbs.			£	s.	d.
8 bags ...	...	8	2	2	at 58/-	...	24	14	0
	Discount, 2½ per cent. ...					...	0	12	4
							£24	1	8
	Charges ...				... ...	...	1	13	4
	Net proceeds				... ...	...	£22	8	4

Messrs. RUCKER & BENCRAFT TO CROWN AGENTS.

19th August, 1897.

GENTLEMEN,

REFERRING to the sale of your coffee yesterday 23 bags ex "Bathurst" was a normal lot of African Liberian and sold at about value.

Two bags ex "Bathurst" was a retail lot and would have sold at 10/- more money if there had been 20 bags of it.

As regards three bags ex "Bathurst" this was also a retail lot, but in quantity it would not have fetched much more money. As to the preparation of this lot, we should imagine much could be done to improve quality, the coffees appear thoroughly worm eaten and the appearance is very rough.

Yours, &c.,
(Signed) J. A. RUCKER & BENCRAFT.

ACCOUNT SALE of 28 bags coffee, per "Bathurst" (s.) at Accra, sold by order and for account of the Crown Agents for the Colonies.

1897.
August 18th.

		c.	qrs.	lbs.			£	s.	d.
23 bags	...	28	0	21	at 39/6	...	55	13	5
2 "	...	2	2	3	" 24/-	...	3	0	8
3 "	...	2	3	22	" 39/6	...	5	16	5
28 bags		33	2	18			£64	10	6
	Discount, 1 per cent. ...					...	0	12	11
							£63	17	7
	Charges ...				... ...	...	15	6	1
	Net proceeds				... ...	...	£48	11	6

DLXXXII.—BOTANICAL ENTERPRISE IN WEST AFRICA.

The development of the system of Botanic Stations in West Africa has been recorded from time to time in the pages of the *Kew Bulletin*. The earliest station was started at Lagos by Sir Alfred Moloney, in 1888; the next at Aburi on the Gold Coast, in 1890, under the supervision of Sir W. Brandford Griffith. The station at the Gambia was established in 1894, and in 1895 Sir Frederic Cardew was successful in arranging for what promises to be a useful station at Freetown, Sierra Leone.

In addition to these, a station was established in 1891, under the Foreign Office, in the Niger Coast Protectorate.

The early attempts to start these stations were necessarily of a tentative character. But the measure of success which attended their efforts to develop the material progress of the West African Colonies led to a desire to place them on a more permanent footing. At a conference held at the Colonial Office, in September, 1893, at which the four West African Governors were present (*Kew Bulletin*, 1893, pp. 363–368), steps were taken to extend the Botanic Station system and to improve the position and standing of the curators.

As a result of this conference, the Botanic Stations in West Africa have been placed on a similar footing to those existing in other parts of the Empire, and their influence and usefulness are steadily increasing. The health of the curators has, on the whole, been satisfactory. The only death amongst the Curators of the existing stations occurred at Aburi in 1895, when Mr. W. Crowther, a remarkably promising man, died after nearly four years' service. There is no doubt that the special leave on full pay granted to West African officers is absolutely necessary to the preservation of health in that part of the world. In order to create an efficient body of native officers to assist in the work of the Botanic stations, and take charge during the absence of the Curators, arrangements were made to train negro boys in horticultural work, and to make a selection of the most promising for further training in the West Indies or at Kew. Two such boys from Lagos were trained by the Botanical Department in Jamaica, and afterwards received at Kew for nearly eighteen months. They returned to West Africa in May, 1894. One is now in charge of the Government House garden and grounds, while the other is Assistant Curator at the Botanic Station.

It is hoped that efforts will be made to train similar men in the other Colonies.

In the meantime it has been sought to increase the efficiency of the Curators themselves, and to afford them opportunities for becoming thoroughly acquainted with the possibilities of development of West African industries.

The official action taken in this direction is shown in the following correspondence :—

Royal Gardens, Kew, to Colonial Office.

Royal Gardens, Kew,
March 25th, 1897.

Sir,

In the memorandum, approved by the Secretary of State, transmitted in Mr. Bramston's letter of September 25, 1893, the conditions of employment of the Curators of the several Botanic Stations in the West African colonies are laid down.

2. Number 4 of these provides that these officers shall have the benefit of the Colonial Regulations as regards, amongst other things, leave. They are therefore entitled to six months' leave of absence on full pay after twelve months' consecutive service in the Gold Coast Colony and Lagos, and after fifteen in Sierra Leone and the Gambia.

3. While I am satisfied that this privilege is essential to the preservation of health necessary for the efficient performance of their duties, I am doubtful whether it is altogether satisfactory to treat such prolonged leave exclusively as holiday. No doubt men, animated with some zeal for their duties, will devote a portion at least of their leave in this country to work which would increase their efficiency. But they are at present under no obligation to do so. It appears to me, therefore, a matter well worth the consideration of the Secretary of State whether in this particular case some modification of the general regulation should not be made.

4. I would suggest that each Curator on his return to England should be required to report himself at Kew, and to devote two months of his leave to the study of such subjects, whether commercial or horticultural, as the Director may indicate to him, and that, further, the receipt of his pay for that period shall be contingent on a certificate from the Director that he has employed himself for the time specified in a satisfactory manner.

I am, etc.,
(Signed) W. T. Thiselton-Dyer.

Edward Wingfield, Esq., C.B.,
Colonial Office,
Downing Street, S.W.

Colonial Office to Royal Gardens, Kew.

Downing Street,
13th April, 1897.

Sir,

I am directed by Mr. Secretary Chamberlain to inform you, in reply to your letter of the 25th of March, that he entirely agrees with you in thinking it desirable that the Curators of Botanical Stations in the West African Colonies should be required to devote a portion of their leave of absence to work which would increase their efficiency.

2. It has always been held by the Secretary of State that the leave which is granted to Europeans in the service of the West African Colonies is not to be treated as an ordinary holiday, and that those that receive it may be called upon to undertake any work, or go through any course of instruction that the Government

may think desirable. Many officers have been required to do so, and there will be no difficulty in laying down the rule which you suggest in the case of Curators.

3. A copy of your letter and of this reply will be sent to the Governors of the four West African Colonies, for their information and guidance.

4. I am to add that Mr. F. E. Willey, the Curator of the Botanical Station at Sierra Leone, has recently arrived in this country, and that he will be told to report himself to you, with a view to his devoting two months out of his time in England to the study of such subjects as you may indicate to him.

I am, &c.,
(Signed) EDWARD WINGFIELD.

The Director,
Royal Gardens, Kew.

COLONIAL OFFICE TO ROYAL GARDENS, KEW.

Downing Street, 6th July, 1897.

SIR,

I AM directed by Mr. Secretary Chamberlain to acknowledge the receipt of your letter of the 24th of June, in which you suggest that Curators of West African Botanical Stations, who are called upon to pursue a course of study at Kew during their leave of absence, should receive an allowance of £10 to cover all travelling and other expenses.

2. It has occurred to Mr. Chamberlain that hardship might be caused in individual cases by the grant of a fixed sum to cover travelling expenses, which must of course vary greatly. He would suggest, therefore, that, unless you see any objection, the allowance should be a fixed sum of £1 for every week spent at Kew, and that the travelling expenses actually incurred should be paid to men who do not live in or near London.

3. The money would only be paid on the receipt of a certificate from you that the officer had completed his studies at the Royal Gardens to your satisfaction.

4. It would be understood that the allowance of £1 a week was made to cover all expenses save those of travelling, and that the only additional payment would be for railway fare from the officer's usual place of abode to Kew, and back again, on the completion of the course.

5. It may be assumed that the total payment to be made would not as a rule amount to more than £10, and Mr. Chamberlain agrees with you in thinking that this sum need not be exceeded unless an officer is forced to pay heavy travelling expenses.

I am, &c.,
(Signed) JOHN BRAMSTON.

The Director,
Royal Gardens, Kew.

During this summer, Mr. F. E. Willey, Curator of the Botanic Station at Sierra Leone, and Mr. Walter Haydon, Curator of the Botanic Station at the Gambia, have devoted eight weeks of their leave (July 5th—August 25th) to a course of study of economic subjects at Kew. They have carefully examined the West African

products in the Museums of Economic Botany, and made notes of those not yet brought into commerce. They have paid special attention to rubbers, fibres, coffee, cacao, spices, and gums, and spent some time in consulting standard books affording the latest information on these and similar subjects. While studying the economic collections of living plants they have made out lists of those likely to be suitable for West Africa, and arrangements have been made to send out a selected number of such plants with them on their return to the Colonies. Visits were arranged for the inspection and trial of machinery for the preparation of coffee and other tropical products, and also to the principal sale rooms in Mincing Lane.

The following memorandum will show what was accomplished in one day's visit to the latter :—

"About a dozen of the principal produce brokers were visited, and large collections of products were seen and examined in the various offices.

"The samples of ginger were particularly interesting. We spent some time in comparing the samples of African ginger, from Sierra Leone, with those which had arrived from the West Indies.

"A considerable difference was noticed in the character of the produce when the two sorts were compared.

"The samples of ginger from Sierra Leone were all coated, and the rhizomes were small. The quality was poor, and the prices obtained were only about one-third of those of the best Jamaica ginger.

"A small quantity only was shown of coated ginger from the West Indies. In nearly all the samples the rhizomes were very much larger than those from Sierra Leone.

"The principal brokers visited were Messrs. Lewis & Peat. Here were seen Jamaica sarsaparilla, Rio and Carthagena ipecacuanha, Chinese star anise, Tinnevelly and Alexandrian senna, Kombe (*Strophanthus hispidus*), Pudding pipe (*Cassia fistula*), coffee, cinnamon, peppers, chillies, nutmegs, mace, and other spices.

"The other products noted during the day were gums, wax, tapioca, ginger, cloves, sugar, cascarilla bark, buchu leaves, myrrh, simarouba bark, &c.

"Fibres were not so numerous as other products, but a few were observed, including raffia, piassaba, bowstring hemp, Mauritius hemp, cocoa-nut coir, and West African piassaba. Very little of the latter was seen.

"After leaving Mincing Lane, a visit was paid to a warehouse in Crutched Friars, where the various drugs were to be seen in bulk, amongst them dragon's blood, gamboge, aloes in skins and in boxes, gum guaiacum, sarsaparilla in bales, ipecacuanha, benzoin, and various other products."

(Signed) WALTER HAYDON.

There can be little doubt that the opportunities thus afforded will be of considerable value in increasing the efficiency of the officers concerned, and in enabling them to disseminate the most recent information in regard to West African industries. It is

impossible to over-estimate the value of such training, and there can be little doubt that the result will be apparent in a much more rapid advance in the material development of these Colonies, which have hitherto been almost entirely dependent on trade in native and forest products, and have devoted little attention to the systematic cultivation of the soil.

DLXXXIII.—MISCELLANEOUS NOTES.

MR. LOUIS GENTIL, a member of the gardening staff of the Royal Gardens, has been appointed by the Government of the Congo Free State to the post of Agricultural Expert. He leaves for Africa in October.

Botanical Magazine for September.—Plates 7552 and 7553 are given to a new species of *Scheelea*, described as *S. kewensis*. It is a native of tropical America, and has been cultivated in the Royal Gardens for many years under the wrong name of *Maximiliana regia*. The plant is now 25 feet high, and flowered for the first and only time in 1895. Other plants drawn are *Cirrhopetalum Curtisii*, *Helianthus giganteus*, and *Veronica balfouriana*. The *Cirrhopetalum* is also a new species, having been sent to Kew by Mr. C. Curtis, F.L.S., of Penang. It is allied to *C. Roxburghii* and *C. concinnum*, both of which are figured in *Hooker's Icones Plantarum*, plates 1057A and 2060B. The *Helianthus* is a very old species, being mentioned in botanical works published at the end of the seventeenth century. The specimen figured was supplied by A. B. Freeman Mitford, Esq., C.B., from his fine garden at Batsford Park, Gloucestershire. The New Zealand *Veronica* is the third new plant published in this number of the Magazine. It approaches *V. Traversii* (plate 6390), differing somewhat in habit, and having longer racemes. The specimen figured was grown in Sir J. D. Hooker's garden at Sunningdale.

Victoria regia.—A new variety of this fine water-lily has been grown at Kew this year. It was raised from seeds received from Mr. H. A. Dreer, nurseryman, Philadelphia. It differs from all other forms in the pale green colour of its leaves, of a rich red underneath, the turned-up rim, which is from 6 to 8 ins. high, the absence of spines on the calyx lobes, and the time when the flowers expand, which is early in the afternoon instead of about six o'clock. It also grows with extraordinary vigour. and flowers more freely than the type. A second plant sent from Kew to the Royal Botanic Gardens, Glasnevin, has shown the same characteristics.

New Wing of Temperate House.—Kew is well supplied with accommodation for plants requiring the temperature of the stove and cool greenhouse, but has long wanted an "intermediate house" of larger dimensions than the Conservatory (No. IV.).

This has been supplied by the erection of the South Wing of the Temperate House. It was included in the original design by

Decimus Burton, the construction of which was commenced in 1860. The octagons were finished in 1861, and the centre block in 1862. The two wings were postponed, although the raised terrace had been prepared for them.

This important addition has been secured in great measure by the exertions of the Right Honourable Joseph Chamberlain, Secretary of State for the Colonies. It is intended to devote it mainly to large specimens of economic plants, such as the Mango, Guava, Cinchona, Sisal Hemp, &c. The construction is composite; the steel principals are supported on cast-iron columns; the sashes and frames are of wood. The internal dimensions are 112 ft. 6 ins. by 62 ft. 6 ins. The height of the centre is 38 ft; that of the side aisles 27 ft. 6 ins. The whole of the plants are grown in beds, the total area of which is 4,842 square feet. The central area is divided into four of these, each 41 ft. by 15 ft. 8 ins. Others, 7 ft. wide, run all round the sides and ends of the house. A thorough system of subsoil drainage has been provided throughout.

In the centre block Australian vegetation is predominant; the South Wing will have largely a Mexican character. At the south end this is emphasized by two pieces of rockwork which have been planted with Agaves, Opuntias, and *Cereus*. With these are associated the Old World Euphorbias and Aloes of corresponding habit. Along the centre path is an avenue of *Cocos plumosa*. Other forms which will be found are *Erythea armata*, *Howea belmoreana*, *Pseudophœnix Sargentii*, *Geonoma gracilis*, *Chamædorea elatior*, *Chrysalidocarpus lutescens*, etc. With these are intermixed a large number of interesting flowering shrubs, such as *Lagerstrœmia*, *Mackaya*, *Erythrina*, *Blakea*, *Alberta*, *Luculia*, etc., for the proper cultivation of which Kew has hitherto been unable to provide the proper conditions. It is intended to proceed at once with the erection of the North Wing, for which a vote on account has already been taken. It is proposed to devote this principally to Himalayan plants.

Water Supply.—When Kew was first devoted to public purposes the area under cultural treatment was very restricted. Up till 1850 the Botanic Garden was supplied with water pumped by a horse-wheel engine (near the present Cumberland Gate) from a well. In that year Messrs. Easton and Amos were employed to erect a steam pumping-engine, with reservoir in the Campanile, for supplying water from the Thames for the Botanic Garden. In 1853 the fountain in the pond was made. About 1855 the pumping station was removed to near Kew Palace. With the growth of the establishment a more extensive supply was required, and the direct supply of Thames water proved unsatisfactory owing to its leaving a muddy deposit on the leaves of the plants. In 1864 the engine house in the pleasure grounds was built to pump the water from the lake. In 1866–8 the present water-works were constructed; the tidal water enters the lake from the river, and after settling is passed through a filter-bed, and then pumped to a reservoir in Richmond Park. The water is thence distributed at high pressure over the grounds, and is also laid on to the Museums, Herbarium, and the Crown property.

For some time this arrangement provided an adequate supply of water for the needs of the establishment. But in recent years it is notorious that the Thames has undergone a considerable change. From various causes it has acquired some of the features of a torrent. Often in flood in winter, it is frequently in the neighbourhood of Kew almost dry in summer, except when filled by the tide. The tidal wave is more rapid and often short, and it is now difficult to secure a sufficient supply to fill the lake on which the whole system of water-supply depends. The first step to remedy this state of things was to make, in 1887, a four-foot culvert calculated to admit at one tide four times the amount of water previously taken in. But the emptiness of the bed of the river during the summer months had another and unforeseen effect. The Royal Gardens are situated on a vast bed of river gravel, which is everywhere pervious to the water of the river. There can be little doubt that the average level of the ground-water has of late years considerably fallen. The effect manifests itself in many ways during dry summers. The older trees suffer severely, and many which have succumbed have had, in consequence, to be removed. The turf and shrubberies have suffered still more, and can only be kept in a tolerable condition by incessant and copious watering. A large extension of the system of water-supply had therefore become absolutely necessary if the attractions of Kew as a garden were not to be destroyed, and the unique collections of plants growing in the open air to suffer irreparable damage. The first step was to remove the vast accumulation of mud, in great part London sewage, from the lake. This was accomplished by the employment of discharged soldiers during the winters of 1891–4. The mud was spread on the stretches of turf to their great advantage. The next was to increase the pumping power, and this was accomplished by the erection, in 1895, of a triple-expansion pumping engine auxiliary to the compound steam-engine erected in 1864. It was followed by the laying down of a complete system of service pipes throughout the establishment. This has been distributed over the past three years and is now completed. At the same time all the hydrants have been fitted with a uniform screw, so that the hose and other apparatus are everywhere interchangeable. The multiplication of stand-pipes will eventually lead to considerable economy by saving the wear and tear inseparable from the use of india-rubber hose in great lengths.

The water-works in the Royal Gardens were connected with the reservoir in Richmond Park by a single seven-inch main, laid down in 1868. This had, owing to the strain of the double purpose it served, shown signs of giving way, a state of things which might have caused grave inconvenience, and, in the event of fire, serious disaster.

During the past winter a second nine-inch main, two-and-a-half miles long, has been successfully laid. As this had to be carried under the line of the London and South-Western Railway, the operation was attended with considerable difficulty. It was, however, successfully accomplished by Messrs Simpson and Co., under the superintendence of Mr. J. Allen, the Assistant Clerk of the Works. The old main is now only used for the distribution of water to the service pipes.

It is further proposed to duplicate the filter-beds. The sand in these requires to be washed periodically, and during this operation the water-supply is either curtailed or altogether in abeyance. A second set is required, a need which was pointed out as long ago as 1875 by the Surveyor of the Office of Works.

Finally, it will no doubt be necessary ultimately to enlarge the reservoir in Richmond Park so as to maintain a more copious head of water in seasons of great drought, such as have been recently experienced.

These particulars are put on record because, probably, few of the visitors to Kew realise the anxiety and expense which, in this and other matters, the maintenance of a great garden imposes on those who have the care of it.

Chinese Bandoline Wood.—The origin of this curious product, of which a specimen has long been in the Museum of the Royal Gardens, has always been a puzzle.

Shavings of the wood yield a mucilage, when soaked in water, which is used by Chinese ladies in "bandolining" their hair. Dr. E. Bretschneider (*Notes on some Botanical Questions connected with the Export Trade of China*, 1880, p. 14) mentions the shavings as being exported from Canton to Peking under the name of "meio kao pao hua" (i.e., cosmetic glue shavings), and their probable source as *Sterculia platanifolia*. In 1895, G. M. H. Playfair, Esq., H.B.M. Consul at Ningpo, sent to Kew specimens in leaf of a tree, called "tiao chang," which he had collected in the mountains near Ningpo, with the information that shavings of the wood were used for the purpose described above by the women of that part of China. These specimens were identified as *Machilus Thunbergii*, Sieb. et Zucc., and flowering specimens subsequently received from the same gentleman confirmed the identification. Mr. Playfair further adds, on the authority of Dr. A. Henry, that the Canton shavings are from the same tree.

The species is a native of Hong Kong and Chekiang westward to Szechuan, in China ; also of Formosa, Japan, and the Corean Archipelago. Owing to the interest attaching to the identification, the species has been figured in *Hooker's Icones Plantarum*, (t. 2538).

The following communication from Mr. Playfair gives some further particulars :—

H.M. Consulate, Ningpo,
March 2, 1896.

MY DEAR MR. THISELTON-DYER,

PLEASE do not retain any doubt at all about the identity of the specimen I sent you of *Machilus Thunbergii* with the Chehkiang tree, which produces bandoline shavings. I cannot, of course, vouch for the Canton shavings as being produced by the same tree, but there is no question that what I sent you does have a glutinous juice, for I tested the large branches thoroughly before sending the smaller piece. My entire specimen was about 12 feet long, and the branch measured quite 2½ inches in diameter. When cut into chips it produced a viscid matter, when soaked in cold water. It is possible that the smaller twigs are not equally viscid. The tree grows in this neighbourhood, and the shavings

used by the Ningpo women are procured locally. It is possible that the Canton shavings may be produced by a similar tree, but I cannot vouch for it. I will procure fruiting and flowering specimens this year, if possible, but the nearest tree I know of is a long way off.

Yours sincerely,
(Signed) G. M. H. PLAYFAIR.

Stooling of gutta percha.—The question whether the tree yielding gutta percha (*Dichopsis Gutta*, Benth.,) will produce shoots from the stump after the tree has been felled is of some practical importance. It appears now to have been disposed of in the affirmative :—

EXTRACT from letter from Director, Gardens and Forest Department, Singapore, dated July 3, 1897.

Re Prof. Ramsay's letter about stooling of "Getah percha." The tree always comes up again when cut down. It can be cut to within six inches of the ground, and will then throw up shoots. Were it not for this there would hardly be a single specimen in this country. It grows slowly in this manner, but never fails to come up again.

It is a very troublesome plant to propagate by cuttings, but this can be done.

Argentine palm kernels.—The palm-kernels to which the following communication relates, were identified at Kew as those of *Acrocomia sclerocarpa*. This is known as the Gru-gru or Macaw palm. It is a native of Jamaica and other West India islands, and of South America from Brazil southwards. The nuts do not hitherto appear to have been turned to any use, though their shell, which is very hard, has been sometimes used for carving.

African Association, Limited.
35a, Castle Street, Liverpool,
May 25, 1897.

DEAR SIR,

My Board instruct me to ask the favour of some information from your department in regard to a considerable quantity of palm kernels lately arrived at this port from the Argentine Republic. They are informed that a very large tract of country produces the palm from which these kernels are gathered, and seeing the large interest of this Association in palm kernels from the Niger Coast Protectorate and other West African districts, my Board are naturally desirous to get what information they can in respect to this new competing product. Can you for their information be so kind as to say, is the palm of the Argentine region a true oil-palm, and would the fruit or kernel of this palm be likely to compare closely, or differ considerably in oily product, from that in which this Company is interested.

Yours faithfully,
(Signed) J. HAMPDEN JACKSON,
Secretary.

The Director,
Royal Gardens, Kew.

Asclepias curassavica as an insectifuge.—The use of this plant for the purposes described in the following communication appears to be unrecorded :—

Rostherne, Red Hill, Surrey,
July 21, 1897.

Miss Manning would be greatly obliged if the Director would tell her what the enclosed plant is. It grows everywhere, as a weed, about the Isthmus of Tehauntepec (Southern Mexico), and is used by the Indians there to keep away vermin, especially fleas. Miss Manning's friends in Mexico have tried it, and found it most successful. They make a rough broom of it, and sweep the floors and walls of their huts, and find that they are not troubled with fleas for a considerable time afterwards. They have tried brushing dogs with it when their coats are full of vermin, and it appears to answer the same purpose with them.

The Indian name of the plant is "Chilpati."

Osiers from Madeira.—The decay of osier cultivation in this country has been discussed in the *Kew Bulletin* (1896, pp. 140–143). As in the case of vegetables (*K. B.*, 1894, pp. 219–223; 1895, pp. 307–315) it seems often cheaper to import than to grow. But considering how easily osiers may be cultivated on land unsuitable for any other crop, it seems strange that basket makers in the East of London should have to go to Madeira for their materials.

WICKERWORK.—This industry has lately been started in the East-end of London, and considerable quantities are made in the blind and deaf and dumb institutions throughout the United Kingdom; in consequence of this a fairly large and increasing export trade is being done in the "osiers," of which the wickerwork is made.

The osier grown in Madeira is *Salix viminalis*. They are chiefly grown at the north side of the island, as they thrive to perfection on the wet portions of land in proximity to the "ribeiros," or mountain streams, which overflow their banks during the late autumn and winter months.

(F. O. 1897. Annual Series, No. 1871. *Report for the Year* 1896 *on the Trade of Madeira*, p. 4.)

ROYAL GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 131.] NOVEMBER. [1897.

DLXXXIV.—WEST INDIA ROYAL COMMISSION.

THE terms of the appointment of the Royal Commission appointed to inquire into the condition and prospects of the West India Colonies were recorded in the *Kew Bulletin* for this year (p. 109.) The Commission accomplished its task and issued its report in the course of last autumn. It has been thought desirable to reproduce in these pages the positive conclusions at which the Commissioners arrived. This is likely to give them a wider circulation than will be reached by the more bulky Blue-book in which they are contained. It has not been thought necessary to include the more formal portions of the report or those relating to the sugar question, on which the Commission was not unanimous.

The conclusions at which the Commissioners arrived as to the natural resources and possibilities of future development of the West Indies have long been known at Kew, where they have for many years been attentively studied. But they have never before been stated in so authoritative a manner. The present distress has been long foreseen as inevitable, and, as far as lay within its power, Kew, with varying success, has endeavoured to prepare for it by such remedial expedients as were possible. But the part of Cassandra is never grateful. The term of office of a Colonial Governor is brief, and there are few who care, or perhaps have the power, to adopt more than an opportunist policy. New industries can only be built up slowly, and the well conceived plans of one Governor do not always commend themselves to his successor. It is certain, however, that in work of this kind no permanent progress can be reached without patient and long-sustained effort.

The Commissioners appended to their report a memorandum by the Assistant-Director, who accompanied the Commission as "expert adviser in botanical and agricultural questions," on the "agricultural resources and requirements of British Guiana and the West India Islands." In accordance with the wish of the Secretary of State that this should be issued in a more convenient form, it will be printed as an additional volume of the *Kew Bulletin*.

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COLONIAL OFFICE to the TREASURY.

Downing Street,
November 9th, 1896.

SIR,

REPRESENTATIONS continue to reach Mr. Secretary Chamberlain giving cause for increasing disquietude as to the prospects of certain West Indian and other sugar-producing Colonies.

2. The Lords Commissioners of the Treasury are aware that the price of sugar in open markets has for some time past been affected by extraordinary depression, caused both directly by the bounties given by some European Governments and indirectly by the effect of those bounties in stimulating an enormous production in advance of effective demand.

3. Early in the year 1895 it was judged necessary by the Marquess of Ripon to sanction special remissions of taxation on sugar estates in British Guiana, Trinidad, and the Leeward Islands, in consequence of the evidence laid before him of the critical position of this industry. In the course of that year very urgent petitions and memorials were addressed to the Secretary of State from practically all the Colonies affected, through their Chambers of Commerce and other associations, making positive statements as to the disastrous effect of the sugar trade in the abandonment of estates and the disorganisation of industry. These representations were endorsed and supported by the Governors. In November, 1895, Mr. Chamberlain was addressed by a very large and representative deputation on behalf of the West India sugar industry, and the commercial and engineering interests associated with it, who desired that he should recommend Her Majesty's Government to take active steps against the foreign sugar bounties as the only means of saving the West Indian Colonies from ruin. A report of the proceedings on this occasion is enclosed.

4. On the 1st of August last the amounts of the bounties offered by the Governments of Germany and Austria-Hungary were approximately doubled, and a Bill has been prepared, and will probably be adopted in France, to raise the bounties in that country correspondingly, although it is computed that they are even now equivalent to a grant of £3 5s. per ton. The new German rates are from 1s. 3d. to 1s. 9d. per cwt., or 25s. to 35s. per ton.

5. The prospect created by the announcement of these increased rates caused a renewed fall of about £3 per ton in the market price of sugar, and has resulted in a fresh series of memorials to the Secretary of State, and in a stimulus to the tendency to abandon the cultivation of estates. Announcements of the intention to do this, and warnings as to the serious consequences that may be expected, are reaching Mr. Chamberlain from most of the Colonies affected.

6. These facts are very briefly recapitulated without detail, which would be superfluous in view of the position which Mr. Chamberlain has so far been forced to maintain towards all such representations, namely, that Her Majesty's Government do not see their way to take any effectual or active steps whatever to countervail the operation of the Bounties.

7. Until recently it appeared not impossible that the Continental Bounties might be spontaneously withdrawn, or that the over-production which they have caused might remedy itself in the natural manner by the collapse of unprofitable businesses. These possibilities are adjourned by the increase in the Bounties above referred to.

8. Mr. Chamberlain feels that he cannot any longer disregard indications which are arising in the administrative purview of this Department of impending liabilities and difficulties which the Colonies will not be able to meet unaided.

9. At the end of the year 1895 there were deficits in Antigua and St. Kitts of upwards of £26,000 and £16,000 respectively, and notwithstanding an unusually heavy sugar crop in those islands, and an increase in the rates of taxation, it is expected that these deficits will be increased during the current year. The population are almost entirely dependent on the sugar estates, and it is represented that estates are being abandoned. There were riots in St. Kitts this spring arising from the reduction of wages on the sugar estates, and if there is any serious lack of employment a recurrence of disturbances may be expected. The Windward Islands have during 1895 and 1896, notwithstanding severe retrenchment and the increase of taxation until the point of inelasticity has been reached, fallen into a position of insolvency which compels Mr. Chamberlain to apply to the Lords Commissioners for an Imperial grant-in-aid, as to which another letter will be addressed to you. The Lords Commissioners will recollect that in the letter from this Department of the 15th of August last, in which Mr. Chamberlain applied for assistance in the promotion of subsidiary industries, which the Lords Commissioners decided not to grant, the possibility that such an appeal might become necessary was foreshadowed. The abandonment of the majority of the sugar estates in St. Vincent has been definitely announced.

10. The Government of Barbados has been passing through severe financial difficulties, involving reductions of the cost of establishments. The effect of the abandonment of estates in this island would be particularly grave and would necessitate assisted emigration.

11. With regard to some of these Colonies there may be reason to think that improvements in manufacture have been neglected. This, however, cannot be said to be the case in Trinidad, where, nevertheless, cultivation is being reduced, nor in British Guiana, where it is being reduced with very serious rapidity, involving the loss of much capital invested in expensive machinery.

12. This process has a special significance in the two last-named Colonies, the Governments of which are responsible for many thousands of coolie immigrants, which they are liable to be called upon, under contract, to repatriate. If sugar cultivation, for which British Guiana and Barbados are specially suitable, and in which a large amount of capital is invested, were abandoned in those Colonies, no alternative industry could at once take its place, and the coolies in British Guiana and the negroes in Barbados would be thrown on the hands of an insolvent administration, which would be unable to provide for their repatriation

in the one case, and for their support or emigration in the other case. The circumstances of Antigua, St. Kitts and Nevis are analogous on a smaller scale.

13. The special danger which appears in the outlook in the Colonies thus dependent on sugar lies in the fact that this industry employs far more labour to the acre than any possible substitute, and that no substitute is immediately available ; that the revenue depends directly on the industry, and that the administrations are, therefore, liable to be financially crippled just when there is the greatest strain upon them, and that any general failure of employment may be confidently expected to produce, if not immediate rioting, at least a very dangerous and unstable situation, in which more efficient police arrangements than exist in the majority of the islands, and possibly the presence of troops or ships of war may be necessary to maintain order.

14. A serious plantation disturbance involving a large number of casualties has been reported from British Guiana by last mail.

15. It must also be borne in mind that the Colonial banking establishments in the West Indies are considerably involved in the sugar industry, and that a collapse of that industry would be likely to bring about a financial crisis, the gravity of which and of its indirect consequences, it would be difficult to estimate.

16. The foreign Sugar Bounties have been and are at present of substantial advantage to some of the industries of this country. It was in great measure on this account that the bill introduced by Her Majesty's Government, in the year 1889, to give effect to the Sugar Bounties Convention was not pressed. It has now, in view of further developments, become a question whether the continued enjoyment of this advantage does not involve the ruin of the British sugar-producing Colonies, and, if so, what this prospect further implies, both as regards the social future of such Colonies and in claims for Imperial expenditure which it will not be possible to resist.

17. The position of affairs being as indicated, Mr. Chamberlain is not prepared, as Secretary of State for the Colonies, to accept the responsibilility of allowing matters to take their course and to acquiesce in the policy of non-intervention hitherto pursued in regard to the Bounties without having satisfied himself as to what such a policy may entail, as regards both the Colonies and the Exchequer, nor would he think it right that Her Majesty's Government should adhere to their present attitude on this question, without knowing, as clearly as possible, at what cost it may be to the welfare and stability of an important part of the Empire, and to industries in which English capital is largely invested.

18. Mr. Chamberlain has, therefore, come to the conclusion that it is expedient that a Royal Commission shall be appointed to inquire into the effect of the foreign sugar bounties upon the British Colonial industry, more particularly in regard to the West Indies, as early as can be arranged, so as to investigate in the Colonies themselves whether their position has improved or retrograded within the last ten years, and the causes involved ; what are actually the state and prospects of the sugar industry,

and of any alternative industries existing or possible to be established; what has been the course of, and what causes have affected, the revenue and expenditure of the Governments of late years; what is the condition and temper of the negro and coolie populations; and what line of industrial development it is likely that these populations may follow with advantage in the event of the extensive abandonment of sugar estates.

19. There are many particulars of inquiry subsidiary to these main heads which would come within the scope of such a Commission; the precise terms of reference may be determined if the appointment of the Commission is decided upon.

20. Mr. Chamberlain desires me to request that you will move the Lords Commissioners to give their serious consideration to this proposal, which has not been made without mature deliberation on a long succession of circumstances conducing to suggest its necessity. As it would be important that the Commission, if appointed, should start for the West Indies without delay and proceed as expeditiously as possible with the proposed investigations and report, Mr. Chamberlain will be glad if the Lords Commissioners will favour him with an early intimation as to whether they agree to the principle of the inquiry he proposes.

I am, &c.,
EDWARD WINGFIELD.

SECRETARY of STATE for the COLONIES to SIR H. W. NORMAN.

Downing Street,
December 29, 1896.

SIR,

I HAVE the honour to transmit to you the Queen's Commission appointing yourself, Sir Edward Grey, Bart., M.P., and Sir David Barbour, K.C.S.I., to be Commissioners to inquire into the conditions and prospects of the sugar-growing Colonies in the West Indies, and appointing Mr. Sydney Olivier, B.A., to be secretary to the Commission.

I have also the honour to inform you that the Queen has been pleased to approve of Daniel Morris, Esq., D.Sc., C.M.G., Assistant-Director of the Royal Gardens, Kew, accompanying the Commission as expert adviser in botanical and agricultural questions.

I have to request that you will be good enough to cause the necessary steps to be taken for carrying into effect Her Majesty's commands contained in the enclosed Commission.

A separate letter is being addressed to you, indicating the points to which Her Majesty's Government wish the inquiry to be specially directed.

I have, &c.,
J. CHAMBERLAIN.

SECRETARY of STATE for the COLONIES to SIR H. W. NORMAN.

Downing Street,
January 5, 1897.

SIR,

WITH reference to my letter of the 29th of December, accompanying the Royal Commission appointing you and Sir David Barbour and Sir Edward Grey Commissioners to inquire into the

present condition and future prospects of the sugar-growing Colonies in the West Indies, and to suggest such measures as appear to you best calculated to restore and maintain the prosperity of those Colonies, and their inhabitants, I have thought it desirable to state more fully than is expressed in the terms of the Commission some of the points to which Her Majesty's Government would wish the inquiry to be directed.

2. In view of the representations referred to in the preamble of the Commission, the first subject for consideration is whether the sugar industry in the Colonies in question is in fact in danger of extinction, and in connection with that question it will be necessary to ascertain what are the causes of the present depression of that industry whether they are temporary or permanent; whether they include matters independent of the competition of sugar produced under the Bounty system, such as extravagance in management, imperfection in the processes of manufacture, inadequate supervision consequent on absentee ownership, and, if so, whether the removal of these causes would enable it to be carried on profitably notwithstanding such competition.

3. A further subject of the inquiry would be whether in the event of the production of sugar in these Colonies being discontinued or considerably diminished, other industries could replace it and be carried on profitably, and could supply employment for the labouring population. If such industries can be indicated, it would also be desirable to ascertain whether they could be established in time to meet any existing crisis. In this branch of the inquiry you will, no doubt, derive valuable assistance from Dr. Morris.

4. It is also of great importance to ascertain what effect the total or partial extinction of the sugar industry would be likely to have upon the condition of the labouring classes and upon the revenue of the Colonies concerned, and whether any loss of revenue could be to any material extent met by reduction of public expenditure, and whether those Colonies would be able to provide the necessary cost of administration, including the relief of unemployed and necessitous persons without subvention from the mother country. If it appears that such subventions will be necessary, Her Majesty's Government would be glad to be furnished with your opinions as to their probable amount.

5. I trust that the Commissioners will find it possible to complete their inquiry in the Colonies within a period not exceeding four months, and in order to facilitate their movements from the different Colonies I have obtained the consent of the Lords Commissioners of the Admiralty to place a gunboat at their service.

I have, &c.,

J. CHAMBERLAIN.

Part I.

ECONOMIC CONDITION OF THE WEST INDIA COLONIES.

10. Your Majesty's possessions with which we have to deal in the present Report are all situated within the tropics, and extend from British Guiana in the south-east to Jamaica in the north-west, through 20 degrees of longitude and 15 of latitude. The difficulties of communication between them may be illustrated by stating that a journey from British Guiana to Jamaica by the mail route occupies eight days, allowing for the present detention of two days at Barbados.

11. The Colonies may, as a whole, be described as eminently suited, both by climate and soil, for the growth of special tropical products, such as sugar-cane, cocoa, coffee, logwood, nutmegs, and various descriptions of fruit, of which the most important are bananas, oranges, cocoa-nuts, and pine-apples.

12. In some of the Islands cattle and horses can be profitably reared, but the raising of stock is never likely to be of more than local importance. There are extensive savannahs in the interior of British Guiana, which are said to be well suited for this purpose, but they cannot be utilised until means of access from the coast are provided.

13. There is no prospect of manufacturing industries being established on any considerable scale. Nor is there any mineral wealth of importance known to exist, with the exception of asphalt, which is obtained from the well-known Pitch Lake of Trinidad, and the gold which has been exported in considerable quantities from British Guiana in recent years.

14. Owing to the nature of the soil and climate such articles of human food as are yielded by cultivation in the tropics can, as a rule, be readily produced in large quantities, and there is consequently no likelihood of any permanent deficiency of the bare necessaries of existence for the labouring classes. For this class of food, which includes yams, sweet potatos, and generally what is known in the West Indies as ground-provisions, there is however, no foreign market of any importance. For articles of food which can only be produced in temperate climates, and for manufactured goods, including clothes, and, generally, for the purchase of imports of any kind, Your Majesty's West Indian possessions are dependent on being able to find a profitable foreign market for the special tropical products which we have mentioned in paragraph 11. It is, moreover, only by means of such an export trade that the population can be maintained in such a condition of prosperity as will permit of sufficient revenue being raised to meet the cost of a civilised Government.

15. The only qualification of this general statement regarding the importance to the British West Indies of the export trade in agricultural products which we find it necessary to make has reference to British Guiana, where the production of alluvial gold is already of considerable importance, and where operations are being carried on for the extraction of gold from quartz reefs. The

asphalt industry in Trinidad is not of such magnitude as to support any considerable section of the population, though it is a valuable source of revenue to the Government.

16. We do not consider it necessary to treat at any length of the economic history of the West Indies, seeing that the special causes of the present depression have only begun seriously to affect the sugar-producing Colonies within the last fifteen years.

17. The prosperity of the West Indies in former times was mainly due to sugar and rum, and the production of these commodities attained such dimensions as to dwarf, and, at one time, almost to extinguish, every competing industry. For many years the sugar industry has, from various causes, been growing less profitable than it used to be, and the production for export of such articles as cocoa and fruit has made considerable progress in some of the Islands. * * * * * *

18. The total value of the sugar products exported was about three and a quarter million pounds sterling, the value of the sugar being some 2,790,000*l*., of the rum 265,000*l*., and of the molasses 195,000*l*.

19. It will be seen that in most of Your Majesty's possessions in the West Indies the products of the sugar-cane, though they are now valued at prices which are much below those which prevailed a few years ago, still form by far the larger portion of the total exports of native produce.

20. The gravity of the immediate danger to the welfare of each Colony which would arise from a failure of the sugar-cane industry may, for practical purposes, be measured by the proportion which the exports of sugar, rum, and molasses bear to the total exports of that Colony.

21. In such an event the welfare of each Colony would in the long run, however, depend on the extent to which it might be found possible to establish other industries. * * * * * *

CONSEQUENCES OF A FAILURE OF THE SUGAR INDUSTRY.

39. If such reduction or extinction of the industry occurs, and if its place cannot be adequately filled by the substitution of other industries, the consequences are likely to be of a very serious character.

40. The immediate result would be a great want of employment for the labouring classes, and the rates of wages, which have already fallen, would in all probability be still further reduced. The public revenue would fall off, and the Governments of some of Your Majesty's possessions would be unable to meet the absolutely necessary public expenditure, including interest on debt, whilst additional outlay would have to be incurred in providing for the population by emigration or otherwise, and the general standard of living would be reduced to a lamentable extent in every Colony which is largely dependent on sugar.

41. The Islands which are likely to suffer most in such a contingency are Barbados, St. Vincent, Antigua, St. Kitts-Nevis, Montserrat, and probably St. Lucia; but none of them would

escape, except Grenada. British Guiana would also suffer severely, and the problem to be dealt with in that Colony might prove to be one of exceptional difficulty. Jamaica and Trinidad have other resources, and the export of sugar from Dominica has already been largely reduced, and now contributes less than one-sixth of the value of the total exports from that island.

42. In British Guiana and Trinidad the necessity for keeping faith with the East Indian immigrants, and of repatriating those of them who had a right to a free passage to India, and wished to take advantage of that right, might involve a large expenditure, which under the circumstances must fall upon the public funds, as it would be impossible to levy the cost from the sugar estates.

43. The present condition of such an Island as Tobago illustrates the serious character of the economic and administrative problem that must arise in Your Majesty's possessions in the West Indies if there is a collapse of the sugar industry. The exports of sugar from Tobago have already decreased very much. The resident population manages to live, but a considerable proportion of them is driven, permanently or temporarily, to other islands in search of work, and it is impossible to raise more revenue than is barely sufficient to meet the necessary expenditure on the cheapest and simplest form of government. New roads cannot be made, and even those that already exist cannot be kept in proper repair out of the revenue. * * * * * *

FUTURE OF THE SUGAR INDUSTRY.

107. The conclusions with regard to the sugar industry at which we have so far arrived may be summed up as follows :—

There is, at present, no prospect of any considerable and permanent rise in the price of sugar in the ordinary course of events.

The effect which the imposition of countervailing duties on the import of bounty-fed sugar into the United Kingdom would have upon price is uncertain, and, for reasons which we have stated, we are unable to recommend such imposition or the grant of a bounty on West Indian sugar.

The cost of producing sugar in those portions of the West Indies where the old processes of manufacture are still followed could in many places be reduced by the introduction, at a considerable cost, of new machinery, but the prospect of profit is not such as to induce capitalists generally to supply the necessary funds.

It is possible that improved varieties of sugar-cane may be discovered, but, in no case, is any such discovery likely to be made in sufficient time to materially alleviate the present distressed condition of the industry.

Some disadvantage is imposed on the producers of rum by the Imperial surtax on imported spirits.

Absentee ownership is not a cause of the present depression, and the extension of resident ownership of estates would not materially improve the prospects of the industry.

Wages and salaries have already been reduced, and no further economy can be expected in respect of them.

108. We feel some hesitation in expressing a positive opinion regarding the future of such an industry as that of the production of sugar, which is liable to be affected by so many unforeseen influences, economic and others, but on a full consideration of the circumstances of the sugar industry in the West Indies we are driven to the conclusion that there is no prospect of the present area of cultivation being maintained. Where the conditions for the production of sugar are favourable, and the latest processes have been adopted, and the best machinery introduced, we believe that some West Indian sugar estates may, even at present prices, continue to show a surplus of receipts over working expenses, but that surplus will not, in our opinion, be sufficient in all cases, after providing for deterioration, and for the results of exceptionally unfavourable seasons, to yield the ordinary market rate of profit on the capital involved in the estates. Under present conditions, therefore, the prospect before the sugar industry is the gradual abandonment of the weaker estates, a process which has already begun, and, in some cases, a failure to renew the machinery as it wears out on estates that are now well equipped, followed in time by a similar abandonment.

109. There is every reason to believe that a very serious condition of things is rapidly approaching in Your Majesty's West Indian possessions, and that the crisis will be reached in a very few years. We have spoken of the abandonment of estates as likely to be gradual, both because the decision to abandon cultivation is not likely to be at once universal, and because on many estates, where such decision is taken, work is not likely to cease altogether until the growing crop and the ensuing ratoon crop, or aftergrowth of the canes, have been manufactured. Where, however, the owners of estates depend on loans for the carrying on of cultivation, the collapse of the credit of the industry may result, in some instances, in the sudden cessation of all employment upon such estates.

110. It is also material to add that the exceptionally favourable season, which some of the Colonies have recently experienced, has to some extent postponed the crisis which must be looked for under normal conditions, and that a bad season would rapidly accelerate the reduction of the present cultivation.

111. It may be that no industry, or series of industries, can be introduced into the West Indies which will ever completely take the place of sugar, and certainly no such result will be attained within the space of a few years, but it is of the utmost importance that no time should be lost in making a beginning of substituting other industries for the cultivation of the sugar-cane.

SYSTEM OF PEASANT PROPRIETORS

112. If the sugar estates are thrown out of cultivation, it is extremely improbable, and, in fact, it may be stated to be impossible, that any industry to be conducted on large estates can ever completely take its place, we have therefore no choice but to consider how means can be found to enable the mass of the population to support themselves in other ways than as

labourers on estates. If work cannot be found for the labouring population on estates, they must either emigrate or support themselves by cultivating small plots of land on their own account. No large industry, other than agriculture, offers any prospect of success, except possibly the gold industry in British Guiana, and when large estates cannot be profitably worked the adoption of the system of cultivation by petty proprietors is inevitable.

113. The labouring population in the West Indies is mainly of negro blood, but there is also, in some of the Colonies, a strong body of East Indian immigrants, and the descendants of such immigrants. The negro is an efficient labourer, especially when he receives good wages. He is disinclined to continuous labour, extending over a long period of time, and he is often unwilling to work if the wages offered are low, though there may be no prospect of his getting higher wages from any other employer. He is fond of display, open-handed, careless as to the future, ordinarily good-humoured, but excitable and difficult to manage, especially in large numbers, when his temper is aroused.

114. The East Indian immigrant, ordinarily known as the coolie, is not so strong a workman, but he is a steadier and more reliable labourer. He is economical in his habits, is fond of saving money, and will turn his hand to anything by which he can improve his position.

115. The cultivation of the sugar-cane has been almost entirely carried on in the past on large estates, but both the negro and the coolie like to own small patches of land by which they may make their livelihood, and take a pride in their position as landholders, though in some cases they also labour at times on the larger estates, and are generally glad to have the opportunity of earning money occasionally by working on such estates, and on the construction and maintenance of roads and other public works. The existence of a class of small proprietors among the population is a source of both economic and political strength.

116. The settlement of the labourer on the land has not, as a rule, been viewed with favour in the past by the persons interested in sugar estates. What suited them best was a large supply of labourers, entirely dependent on being able to find work on the estates, and, consequently, subject to their control and willing to work at low rates of wages. But it seems to us that no reform affords so good a prospect for the permanent welfare in the future of the West Indies as the settlement of the labouring population on the land as small peasant proprietors; and in many places this is the only means by which the population can in future be supported. The drawbacks to the system of peasant proprietors have hitherto been their want of knowledge and care in cultivation, and the habit of what is called prædial larceny. The latter term is applied to the theft of growing crops, which is said to be very prevalent. We do not believe it will disappear until such practices are universally condemned by native public opinion, which, unfortunately, does not appear to be the case at present, and in the meantime each Colony must deal with the question as

may seem best. The small proprietors show some desire to improve their modes of cultivation, and we shall have some suggestions to make on this subject.

117. But whilst we think that the Governments of the different Colonies should exert themselves in the direction of facilitating the settlement of the labouring population on the land, we see no objection to the system of large estates when they can be maintained under natural economic conditions. On the contrary, we are convinced that in many places they afford the best, and, sometimes, the only profitable means of cultivating certain products, and that it is not impossible for the two systems, of large estates and peasant holdings, to exist side by side with mutual advantage.

118. It must be recollected that the chief outside influence with which the Governments of certain Colonies have to reckon are the representatives of the sugar estates, that these persons are sometimes not interested in anything but sugar, that the establishment of any other industry is often detrimental to their interests, and that under such conditions it is the special duty of Your Majesty's Government to see that the welfare of the general public is not sacrificed to the interests, or supposed interests, of a small but influential minority which has special means of enforcing its wishes and bringing its claims to notice.

ESTABLISHMENT OF A DEPARTMENT OF ECONOMIC BOTANY IN THE WEST INDIES.

119. The practical work of cultivating new products must be left in the hands of private persons, whether owners of large estates or peasant proprietors, but there are certain directions in which assistance can be given by the State.

120. Your Majesty's West Indian possessions are, as a rule, not of large extent, and some of them, though possessing separate administrative and financial systems, are of very limited area. Communication between them is difficult, and with the outside world it is both tedious and expensive. The persons engaged in cultivation suffer from this state of isolation, and are often without any information as to what is being done elsewhere. The cultivator of one product is often quite ignorant of the best means of cultivating any other, and does not know whether his soil and climate might be better adapted for something else. These remarks have special reference to the small cultivators, but they are not wholly inapplicable to persons interested in the larger estates.

121. The botanical establishments in the larger Colonies, such as Jamaica, Trinidad, and British Guiana, have already rendered considerable assistance in improving agricultural industries, and they are capable of being made increasingly useful in this respect. In the Windward and Leeward Islands and Barbados, small establishments called botanic stations were established a few years ago on the advice of the Director of Kew Gardens, and the results, though not yet extensive, have been of a distinctly promising character. It is evident that to grapple with the present circumstances, there is required for the smaller islands a special public

department capable of dealing with all questions connected with economic plants suitable for growth in tropical countries, and we recommend the establishment of such a department, under which should be placed the various botanic stations already in existence. These stations should be enlarged in their scope and character, and be organised on the lines found so successful in Jamaica. In the latter Colony it is admitted that intelligent and progressive action in the direction of encouraging a diversity of industries has produced most satisfactory results. To achieve this result has however, taken more than 20 years of persistent effort, and the Government has spent more than 100,000*l*. during that period on its botanical establishments. The department has distributed seeds and plants at nominal prices by means of the post office, Government railways, and coastal steam service; it has supplied information orally, or by means of bulletins, regarding the cultivation of economic plants, and has encouraged the careful preparation of the produce by sending agricultural instructors on tour through the Island to give lectures, demonstrations, and advice.

122. The special department recommended for carrying on similar work in the Windward and Leeward Islands should be under the charge of a competent Imperial officer, whose duty it would be to advise the Governors in regard to all matters affecting the agricultural development of the islands. He would take part in consultations with the object of improving agricultural teaching in colleges and schools, and of training students in agricultural pursuits, and would attend to the preparation of suitable literature on agricultural subjects. The existing botanic stations should be placed under his supervision, and the charge of maintaining them transferred to Imperial funds. Each botanic station would be actively engaged in the introduction and improvement of economic plants, and in propagating and distributing them throughout the island. It would carry out the experimental cultivation of new plants to serve as an object lesson to cultivators, and it would be prepared to give the latest information to inquirers regarding economic products, and to provide suitable men as agricultural instructors. To effect all this will require funds entirely beyond the present resources of the smaller islands. We are, therefore, of opinion that as the necessity for such a department is urgent, the cost should be borne by the Imperial Exchequer.

123. The promising experimental work connected with raising new varieties of canes, and increasing the production of sugar by the use of manures and other means should receive special attention. The cost of some of this work would be a legitimate portion of the charge above stated. The chief experiments might be carried on as hitherto by the officers in charge of them in British Guiana, Barbados, and Antigua, but continued and extended, if found desirable, in Trinidad and Jamaica. In addition, the botanic stations in the Leeward and Windward Islands, would maintain nurseries for the introduction of all new and promising canes, and would undertake the distributing them within their respective spheres of action. A memorandum by Dr. Morris on this subject containing detailed proposals which we generally approve, is printed as an Appendix to this Report.

124. In dealing with the question of introducing new industries into the West Indian Colonies, or of extending existing industries, it must be borne in mind that for many of the special products of the West Indies there is only a limited demand. There is, for example, a comparatively large market for coffee, but not for such products as arrowroot or nutmegs, and if they were extensively grown in a number of the Islands they would soon cease to command a remunerative price. This has actually happened in the case of arrowroot.

EDUCATION:—ELEMENTARY, AGRICULTURAL, AND INDUSTRIAL.

125. In the course of our stay in the West Indies our attention was frequently called to the question of the progress of general education, and we obtained a considerable amount of information on this subject. There has been a marked increase of expenditure on this account in recent years, and, no doubt, the efforts made for the extension of education have been largely successful. The total expenditure on education amounted to about 95,000*l.* in 1882, and to nearly 180,000*l.* in 1896, showing an increase of about 90 per cent. It may be hoped that in Jamaica and Grenada, and probably in Trinidad also, it will not be found necessary, on financial grounds, to curtail this expenditure, but if the sugar industry fails in British Guiana and in the islands not mentioned above, the revenue may be quite unequal to the maintenance of the whole of the existing schools.

126. At the present time a system of training in agricultural occupation is much needed. We think that some, at least, of the botanic stations should have agricultural schools attached to them, where the best means of cultivating tropical plants would be taught, and if elementary training in agriculture were made a part of the course of education in the public schools generally, the Botanic Department would be in a position to render valuable assistance.

127. Agriculture, in one form or another, must always be the chief and the only great industry in the West Indies, but a system of training in other industrial occupations, on a limited scale, is desirable, and would be beneficial to the community.

ESTABLISHMENT OF A TRADE IN FRUIT:—SHIPPING FACILITIES.

128. There are good grounds for thinking that the West Indies might profitably grow fruit for export in larger quantities than at present. The fruit trade between Jamaica and New York has already attained important dimensions, and it seems possible that a similar trade might be established with some of the other Islands.

129. In time it might be found practicable to send fruit to the London market. If this could be done, the gain to the whole of the West Indies would be very great. We believe that the opportunity of selling their fruit cheaply in London would be of

the greatest value, and there would be no risk of the trade being interfered with by hostile tariffs. If a number of steamers were regularly employed in such a trade they would, no doubt, carry British products to the West Indies on their return voyage, and to a certain degree reduce the loss of trade which has been caused by the diversion to the United States of West Indian sugar and of the Jamaica fruit exports.

130. The difficulty of establishing such a trade is due to the fact that a considerable amount of capital would be required, and that there would be serious risk of mistakes and loss whilst the business was in the experimental stage. At present there is only the small local demand for fruit in most of the Islands, and consequently fruit is neither grown in large quantity nor of the best quality.

131. It cannot be expected that large quantities of fruit should be grown until there was an assurance that vessels would be forthcoming to convey it to market, and good ground for believing that it could be sold at a profit.

132. On the other hand, it is improbable that shipowners would provide vessels for conveying the fruit to market until they were satisfied that the fruit would be forthcoming and the fruit trade permanent.

133. We think that the prospects of success are such that the experiment should be tried. The Botanic Department, which we have recommended, should give instruction as to the best means of cultivating the fruits that are likely to find a profitable market, and of packing them for conveyance on board ship, while the Governments of the Islands which are most favourably situated with reference to the New York market should encourage the growth of such fruit. A subsidy might be granted for some years to secure the establishment of regular steam communication from St. Vincent and Dominica to the United States, with a view to the export of fruit to New York, and if the experiment proved successful, the scheme might be extended to other Islands. In view, however, of the large expenditure which such an attempt must involve, and of the uncertainty, at present, of the result, we do not recommend that any experiment should be carried, in the first instance, beyond the limits we have just indicated.

134. Representations were made to us that the Royal Mail Steam Packet Company, which receives a large annual subsidy for the carriage of mails, contributed jointly by the Imperial and Colonial Exchequers, gives insufficient facilities for the conveyance of fruit or other perishable produce to England or between the Colonies, and charges excessive rates of freight on such produce. The opinion is also prevalent that the voyage between England and Barbados is unnecessarily protracted.

135. It is questionable whether the Colonies in the present state of their public finances can justifiably afford the high subsidies they now pay for the sake of the present postal service only, more especially as it might not be impossible to make other more economical, if somewhat less efficient, arrangements.

136. We do not desire to recommend that the West India mails should, after the expiration of the present contract, be sent

viâ New York; but we think it well to point out that communication by this route would offer greater commercial advantages to some of the Colonies than the present arrangements; and that the time occupied in the transit of mails need not, in all cases, be greater, and, in the case of Jamaica, would be less than now.

137. It will be sufficient for us to suggest that endeavours should be made to ascertain, at a sufficiently early period, before the expiration of the present contract with the Royal Mail Company, whether alternative tenders offering greater advantages cannot, on sufficient notice, be obtained from other shipping companies, or at any rate to secure that under the next contract, the mail service shall be conducted in a manner better adapted to the more pressing needs of the Colonies in their present condition.

INTER-COMMUNICATION BETWEEN THE DIFFERENT COLONIES.

138. It is of great importance that there should be cheap, regular and frequent means of communication between the different Islands. The want of such facilities was specially brought to our notice in many of the Colonies.

139. Such means of communication will assist, or even create, trade in local products, will tend to remove that condition of isolation which exists at present, and will enable labourers to move freely to the best markets for labour, a result which is of special importance at a time when many persons are likely to be thrown out of employment in some of the Islands.

140. Various proposals have, we understand, been put forward, and some experiments tried, for establishing such means of communication, which have fallen through for lack of funds and from other causes.

141. Without attempting to prescribe in detail the arrangements that should be made for establishing easy communication by steamers between the Colonies, we may indicate in general terms the facilities which we recommend should be provided.

142. The Islands of Grenada and St. Vincent should be connected with Trinidad and Barbados by a steam service, affording facilities for the shipment of perishable produce and providing for the transit of passengers at low rates of payment.

143. Grenada, St. Lucia, and St. Vincent form at present the Government of the Windward Islands, and it would be convenient to that Government, especially if its headquarters are retained at Grenada, that the Island of St. Lucia should be included in the circuit of the proposed service. The interposition of a call at Barbados between St. Vincent and St. Lucia would no doubt be attended with some disadvantage, but the establishment of easy communication between Barbados and all the other Islands of the Windward group is of an importance which outweighs this consideration.

144. Similar means of inter-communication are required in the Leeward Islands, and these might be provided by arranging that

the steamer running from Barbados to St. Lucia should proceed to Dominica, Montserrat, Antigua, Nevis, and St. Kitts, and return within the week, after completing the circuit.

145. The maintenance of frequent communication between Tobago and Trinidad is also desirable, and the present service between these islands could be improved by arranging that the steamer connecting Barbados and the Windward Islands with Trinidad should call at Tobago, thus giving also direct means of transit between Barbados and Tobago, an object which appeared desirable to some of the persons who gave evidence before us in the latter Island.

146. The complete double service suggested could be carried out by two steamers of moderate size, each running from Trinidad to Antigua one week and from Antigua to Trinidad the next, so as to give through communication between all the Islands by a weekly service each way.

147. The subsidy required need not be of very large amount.

AGRICULTURAL BANKS AND STATE LOANS.

148. During our stay in the West Indies, the want of what was called "cheap money" was frequently and strongly brought to our notice, and it was urged that private persons engaged in agriculture should be enabled, by the assistance of the State, to obtain loans of money at a low rate of interest.

149. Owing to the small size and the isolation of many of the Colonies, banking facilities are no doubt limited, and there is a want of competition; but the main cause of the inability of agriculturists to obtain loans, as well as of the high rates of interest which are sometimes charged, appears to us to be the risk of loss which is inseparable from business of this class, especially in the present distressed state of the sugar industry.

150. We do not doubt that in some cases, and under very careful management, advances of money by the State, or on a State guarantee, would be beneficial to agriculturists, but any system of State loans, or a State guarantee, is so liable to be mismanaged, and so likely to end in the loss of the money advanced, that we hesitate to recommend its general introduction.

151. The owner of a sugar estate who found himself in difficulties, and whose credit had fallen so low that he could not obtain advances from a private institution, or could only obtain them on very onerous terms, would no doubt be glad to obtain a loan from the State at a moderate rate of interest, but we think it would be unwise, in the present state of the sugar industry, to engage the public resources in what would be a very risky speculation.

152. The class of small cultivators who would be likely to take advantage of such advances are, as the evidence given in Grenada and elsewhere indicates, both open-handed and improvident: they would readily take loans at a low rate of interest; and they would doubtless repay the money when the time came if they were in a position to do so; but we greatly doubt whether they would, as a body, make any special provision beforehand to enable

them to repay it, or to guard against the innumerable accidents that might interfere to prevent them from paying. The experience of the different Colonies as regards the payment of direct taxes, and the payment of instalments of the purchase money of Crown lands as they fall due, is not encouraging.

153. At the same time we are not prepared to say that under special circumstances a Colony might not be justified in assisting agriculturists to obtain small loans at a low rate of interest to assist them in improving their land, but we think it should be left to the Governments immediately concerned to move in the matter in the first instance, and that the risk of loss should be borne by Colonial resources, and should not be thrown on the Imperial Exchequer. * * * * * *

Part II.

CONDITION AND PROSPECTS OF THE SEVERAL COLONIES.

173. We have dealt in Part I. of our Report with the general condition of Your Majesty's West Indian possessions as a whole, the prospects of the sugar industry, the consequences of a failure of that industry, and the measures to be adopted in view of such failure.

174. In the present portion of the Report we propose to take up the case of each Colony separately, to state briefly its economic condition and prospects, and the state of its finances; to indicate any modifications which must be made in our general proposals to adapt them to the special requirements of each possession, and to set forth any further recommendations we may have to make, and which are of local rather than general application.

175. The agricultural capabilities and wants of each Colony have been dealt with by Dr. Morris in a series of separate reports on British Guiana and Your Majesty's West Indian Islands, and it will not, therefore, be necessary for us to enter into the question of the resources of each possession as fully as would otherwise have been the case.

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i.—BRITISH GUIANA.

176. We landed at Georgetown, the capital of British Guiana, on the morning of the 27th of January 1897, and left again on the afternoon of the 6th of February. During five days of our visit we took evidence in public, examining 49 witnesses, and in other ways endeavoured to obtain a knowledge of the condition of the Colony for the purposes of our Report. We visited and inspected two important sugar estates, and held conversations with many persons of much experience in the Colony.

177. British Guiana alone, of the British sugar-producing Colonies in the West Indies, is situated on the mainland of America, and it is the most southerly of all these Colonies. It is

very much larger than all the British West Indian Islands put together, and the land occupied by cane cultivation is all on or close to the coast, and lies so low that extensive sea defences and a system of steam pumping must be maintained. The greater portion of the Colony, considerably more than 99 per cent., is uncultivated and unoccupied, being either covered with forest or consisting of grassy and swampy plains, known as savannahs.

178. The total area is officially estimated at 65,836,000 acres, and the extent under sugar cane at 66,908 acres. The exports consist almost entirely of sugar and gold. In addition to the cane cultivation there is a considerable production of articles of food for local consumption, and some attempts are being made on a small scale to open up the Colony and to restore cultivation which formerly existed in parts of the interior along the rivers, not far from the sea coast, but which has for many years been abandoned.

179. The population at the time of the last Census in 1891 was 278,328, and is, no doubt, increasing. Of the population in 1891, Europeans, other than Portuguese, were 4,588, Portuguese 12,166, Aborigines 17,463, Africans 3,433, Black and Coloured 141,531, and East Indians 105,463.

180. The leading features of the Colony and its general capabilities are fully described in the report of Dr. Morris. From that report, and from the evidence received by the Commission, it is clear that British Guiana is in the perilous position of being dependent on a single agricultural industry, the production of sugar, that industry being in a state of extreme depression and threatened with possible extinction, whilst it is difficult to see how it can revive or even be maintained under present conditions.

181. The exports of sugar, molasses, and rum, which in the five years 1881 to 1885 were valued at 12,038,699*l*., fell to 9,305,880*l*. in the next five years, and in the five years 1891–92 to 1895–96, to 8,276,916*l*., or an average of 1,655,383*l*. per annum. But in the year of account, April 1895 to March 1896, the value of such exports was only 1,183,000*l*., and in the calendar year 1896, 1,280,000*l*. In the years preceding 1885 the average annual value of sugar products was well over two millions sterling, and indeed in some years almost three millions. There has thus been a heavy falling off in the value of the exports of sugar products, whilst the value of other exports, which in 1882 amounted to 60,000*l*., excluding gold, was, in 1895–96, only 35,000*l*. The export of gold, however, had increased in value from 3,000*l*. in 1882 to 450,000*l*. in 1895–96.

182. The quantities of sugar exported in the three periods just referred to were, for 1881–85, 552,687 tons; for 1886–91, 579,924; and for 1891–92 to 1895–96, 547,282, showing that the gross output has been comparatively well maintained, notwithstanding the great fall in value.

183. The revenue, which was 458,600*l*. in 1882, rose to 602,700*l*. in 1893–94, and fell to 588,200*l*. in 1894–95, and to 567,700*l*. in 1895–96, and is understood to be still very markedly falling off. The expenditure, which was 429,000*l*. in 1882, was in 1895–96

596,500*l*. The debt is now nearly one million sterling, and the charges for interest and sinking fund, which in 1882 were 14,277*l*., are now about 48,000*l*. a year.

184. The financial position of the Colony is, therefore, not encouraging, and taxation under present circumstances can hardly be increased. The Colony is certainly not in a position to stand the strain of additional outlay, even for the relief of distress or the opening up of better communication with the interior than now exists. The revenue depends chiefly on duties of customs and excise, and may be expected to diminish seriously as the purchasing power of the community falls off, owing to reduced wages and loss of employment arising from contraction of the sugar cane cultivation. * * * * * *

189. The report of Dr. Morris shows that whilst British Guiana now depends on sugar products for the maintenance of the Colony, it is certain that under the most favourable circumstances it must be a considerable number of years before other industries could be so far extended as to give employment to the number of people now employed on sugar estates or deriving their living from the sugar industry. Indeed it is hardly possible that all the other industries in the Colony, apart from gold, which will be presently spoken of, could for many years to come produce a return in any way equal to that which has been obtained from sugar and rum.

190. It would, therefore, be most desirable in the interests of the Colony to maintain the production of sugar, as well as to encourage the cultivation of all the products mentioned by Dr. Morris, which have been neglected in the past. Foremost among these may be named rice, coffee, cocoa, fruits, and cocoa-nuts, whilst something may be expected from attention to the forests and from cattle raising.

191. Rice to the value of 180,000*l*. was imported in 1895–96 for consumption in the Colony. Rice of excellent quality is already grown in British Guiana, and every effort should be made to produce locally all that is wanted of this article. Coffee and cocoa to the value of 7,560*l*. were also imported, though there is no reason why the coffee and cocoa consumed should not also be produced there.

192. The gold industry is deserving of special attention. The value of the gold exported since the year 1890 has been close upon three millions sterling, and although the production is now less than in 1893–94, when it was of the value of 510,710*l*., it amounted in the course of the year 1896 to 461,000*l*. The Government should endeavour, by the employment of qualified experts, to ascertain what are its future prospects, and if the result should be promising, every facility should be given for the development of the industry by private enterprise. * * * *

196. It is difficult to exaggerate the evils that would arise from a collapse of the sugar industry. Thousands of labourers and others would be thrown out of employment; it might be necessary to support large numbers of coolies and to repatriate them at a heavy cost, which the planters could not meet, and local resources would be quite insufficient to enable the Government to be carried on in any way at all worthy of a civilised nation.

197. The evidence shows that already there is much poverty in the Colony, especially in the Capital, among skilled artisans and mechanics as well as among persons above the labouring class, whom it would probably be impossible to settle upon the land.

198. In British Guiana, indeed, as in some of the other West Indian Colonies, it is difficult to see how a crisis can be averted and heavy demands on the mother country avoided, unless something can be done to save the sugar industry, or at all events to prevent any early or sudden collapse. The very difficult problem whether any general measures can be taken with the object of saving the industry, either by effectual action for the abolition of the bounty system or by the imposition of countervailing duties has been dealt with in the first part of this Report. If any such measures are practicable they would need to be applied promptly; but in any case we wish to emphasise our conviction that even if the sugar industry can be maintained it is essential that the Government of British Guiana should do all in its power to open up communications, to encourage settlement in the interior lands, to arrange for proper instruction of the settlers in agriculture, to employ scientific and experienced mineralogists to survey and report on the gold fields, to provide for the conservation and utilisation of the forests, and in every way to encourage the development of the industries indicated by Dr. Morris. * * * * * *

200. It is, indeed, most satisfactory to find that so competent a judge as Dr. Morris considers that there is a possibility of British Guiana becoming in course of time a very productive as well as a very important dependency of the Empire, but no such result can be expected for many years.

201. To effect such development as seems possible in British Guiana will, moreover, be a work for which resources will not be readily forthcoming. New industries are not likely to succeed on the front lands where sugar is now grown. The development of these industries will not merely entail a change of cultivation, but the opening up of new lands in the interior and a migration thither of a considerable part of the population.

202. There can, therefore, be no question of the vital importance to the Colony of maintaining the sugar industry, if possible, and of giving every encouragement to the planters in their efforts to do so. At the same time, if the sugar industry is maintained, the Government must be very careful not to allow its influence to retard the settlement and opening up of new lands, which have hitherto been left inaccessible and undeveloped, partly owing to the interest of the Colony having hitherto been entirely concentrated on sugar.

203. It will be very difficult to provide funds for the necessities of administration if a collapse of the sugar industry takes place, but considerable economies have been either carried out or decided upon. No doubt other reductions could be made under the pressure of circumstances, but these reductions would go only a small way towards meeting the shrinkage of income and the heavy additional charges which are inevitable if the sugar industry dies out, and it might probably prove impossible to meet

existing charges of an obligatory character, among which interest on debt, pensions, maintenance of the poor, and payment of police may be classed. * * * * * *

205. It is only just, before concluding these observations, to say that the planters in Guiana have not been behindhand in efforts to improve the cultivation and the manufacture of sugar, and that their efforts have been attended with remarkable success. The amount of sugar and rum produced has been well maintained, and the cost of production has been greatly reduced. If it had not been for these efforts, and for an expenditure on machinery which during the last fifteen years has amounted to 1,307,500*l.*, the sugar industry must have practically succumbed. The evidence given, and the information obtained in various ways, make it clear that though estates have struggled on, and a few have even made some slight profit, many of them cannot be carried on at present prices, while a material fall would compel the proprietors of most of them to cease cultivation.

206. If such a crisis should arise, and it may come very soon, the Government could only be carried on even in the most economical manner by the aid of subventions from the Imperial Exchequer, and a very heavy charge would probably have to be met for the repatriation of Indian coolies. * * * * * *

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ii.—BARBADOS.

208. We landed at Bridgetown, Barbados, in the course of our voyage to British Guiana, but did not on that occasion transact any formal business. We returned to the island on the morning of the 16th of February, arriving from St. Vincent, and remained until the afternoon of the 24th of the month. We took evidence publicly for four days, hearing 39 witnesses, and also visited various parts of the island and inspected several sugar works.

209. The condition of Barbados is markedly different from that of any other Colony in the West Indies. It is very thickly populated; the area is 166 square miles, and the number of inhabitants 186,000, giving an average of 1,120 to the square mile. The whole island is already occupied and developed, the total acreage is 106,470 acres, of which 100,000 are stated to be under cultivation. There are no Crown lands, no forests, no uncultivated areas, and the population has probably reached the maximum which the island can even under favourable circumstances support.

210. The climate is healthy; there are many white families, numbering altogether some 20,000 persons, most of which have for generations looked upon Barbados as their home; and the attachment of the inhabitants to the island and to the traditions of the past is exceedingly strong.

211. With so large a population the labour supply is abundant, and though wages have lately been reduced, there have not hitherto been any serious labour difficulties. The island has been settled for so long and so many generations have lived side by side, that a general understanding appears to have grown up of the respective habits and requirements of different classes. This

circumstance and the density of the population are no doubt the reasons why there are not in Barbados the complaints of the supply, or of the efficiency, of labour, which are so frequent elsewhere.

212. In Barbados there is substantially but one industry, one product, and one export—that of sugar,—nor does the island appear to be suited for the growth of either coffee, cocoa, or fruit, on a scale of any commercial importance.

213. The value of the total exports of the produce of the Colony in 1882 was 1,004,000*l*., the value of sugar products exported being 993,000*l*.; that of the total exports in 1890 was 1,041,000*l*., of which sugar exports made up 1,032,000*l*.

214. In 1896, when the value of the exports had fallen, the proportion contributed by the sugar industry remained about the same; the figures were then 577,000*l*. for the total exports of produce of the Colony and 558,000*l*. for sugar exports.

215. The quantity of sugar exported in 1882 was 49,458 tons, in 1890, 76,735 tons, being the largest amount recorded within this period, and in 1896, 44,460 tons. The crop in 1895 was very seriously affected by drought and disease, and in 1896 to some extent by the latter cause.

216. There are no large central sugar factories, the mills are small and many of them primitive, a large proportion of them being worked by wind power, and the sugar exported is chiefly muscovado. But the industry has hitherto survived under these conditions, owing to the fact (1) that the manufacture of sugar by the old processes is thoroughly well understood and the cultivation of the cane very carefully carried on; (2) that there is an abundant labour supply; and (3) that the soil produces a cane containing juice of exceptional richness.

217. The average net cost of production was given to us as 8*l*. 12*s*. per ton, but, without going too closely into the accuracy of such figures, it is certain that at present prices, and under present conditions, the industry cannot hold its own, and a very serious reduction of it is imminent.

218. It may be said, generally, that, whilst estates in favourable situations with favourable seasons may just make a profit, even at present prices, others are being worked at a loss. The estates in Barbados are, as a rule, very heavily mortgaged, and advances for carrying on cultivation are only to be obtained with increasing difficulty. Such advances are becoming more necessary every year, as the working capital of the proprietors is exhausted. Any additional adversity, such as a bad season or two, would cause great disaster.

219. Many estates are now being carried on under the Agricultural Aids Act, which makes money advanced for working an estate a first charge on the growing crop. The amount borrowed yearly in this way is increasing, and amounted to 100,661*l*. in 1896.

220. It must be borne in mind, when judging of the figures given for the working of estates in 1896, that there was a considerable rise in the price of sugar in the early months of that year. This rise was generally attributed to speculation founded upon the great interference with production in Cuba. Whatever

its origin, it did not last, but it did make the average price of sugar higher in 1896 than it is at present, and enabled some estates to show better results for that year than they could at existing prices.

221. As is usual in the West Indies, the public revenue is derived mainly from import duties and excise, and depends therefore chiefly upon the welfare and the purchasing power of the wage-earning population. The reduction of wages has diminished their purchasing power, and the effect of this upon the revenue has been very marked. * * * * * *

223. In 1895 and 1896 the rates of taxation were largely increased, with the object of restoring the balance of the finances, and the revenue for 1896 rose accordingly, but there was nevertheless a deficit of 6,988*l*. on the transactions of that year, following one of 5,763*l*. in 1895. The amount of the funded public debt of the island is now 405,100*l*., and the provision for interest and sinking funds in the estimates for 1897 amounts to 19,125*l*.

224. Our attention was directed both by the Auditor-General and the Colonial Secretary to the great excess in value of imports over exports. The figures for the last three years are as follows, including re-exports :—

Year.	Imports.	Exports.
	£	£
1894	1,279,334	984,511
1895	956,921	587,298
1896	1,048,886	758,227

225. It was suggested to us that some of this excess is being paid for out of capital, and that the imports have been kept up by a drain upon the resources of the island, which cannot continue. This may be so, but some allowance ought to be made for special circumstances, such as public expenditure in the island out of loans, military expenditure by the Imperial Government, remittances made by emigrants, and purchases made by crews or on behalf of shipping in the harbour.

226. Unless some improvement in the sugar trade takes place, the revenue will continue to decrease, while a serious reduction of the sugar industry, such as is probable, would make it impossible for the Government to pay for the administration of the Colony.

227. The state of things in Barbados and the outlook may be summed up by saying that there is but one industry upon which the population and the revenue are absolutely dependent ; that this industry is now without credit, and is to a considerable extent being carried on at a loss, while, for special reasons, the distress caused by the failure of it will be exceptionally severe, and there is practically no other industry or industries which can be substituted for the production of sugar so as to maintain the population and provide sufficient public revenue.

228. A further circumstance which will to some extent affect the prosperity of Barbados is the intended transfer of the Imperial troops to St. Lucia. We were informed that the presence of the troops leads to a yearly expenditure in the Colony of about 50,000*l*. of Imperial money. This causes a demand for local products which will be lost when the troops are removed.

229. No time, therefore, must be lost before deciding upon such measures as can be taken.

Settlement on Land.

230. As sugar lands fall out of cultivation they can either be sold in small lots or leased at low rents to small cultivators. This policy would probably be adopted at once by the Court of Chancery in the case of sugar estates which clearly could not be carried on except at a loss; and in this way a certain portion of those who can no longer find employment in the sugar industry might obtain the means to support themselves by growing ground provisions or other crops, which will contribute to the food supply of the island and make it less dependent upon outside sources. In this matter the Court of Chancery must, of course, be guided by the interests of the persons whom it represents, but it may be possible for the Government to facilitate the breaking up of estates in this manner by purchasing and re-selling them in small lots. * * * * * *

Emigration.

233. Emigration is a natural and, in view of complaints as to want of labour elsewhere, at first sight a promising suggestion. A considerable number of Barbadians do at present emigrate, permanently or temporarily, in search of subsistence, and many of them make excellent colonists in their new homes. But such experiments as have been made with the special object of supplying Barbadian labour to sugar planters in other colonies have not proved satisfactory. More than one reason was given for this, which will be found in the evidence, but apart from this difficulty it is certain that if the sugar industry fails in Barbados, it will fail also in the other Colonies, and there can be no demand in them for labourers on sugar estates. In other words, the greater the pressure of want which arises in Barbados, the less will be the opportunity of finding employment for emigrants on sugar estates elsewhere, though, on the other hand, if the sugar industry fails the pressure of want will doubtless strengthen the desire to emigrate.

234. Strong objections were raised by witnesses to the form which emigration takes at present. It was urged that the hap-hazard emigration of able-bodied men, leaving wives, children, or relations unprovided for at home, was not an advantage, but we do not see how such emigration can be interfered with even were it desirable to do so.

235. It would seem that the only form in which assisted emigration may be at the same time possible, desirable, and successful, is that of removing whole families and placing them in settlements in less thickly populated countries. Where, as in British Guiana, Trinidad, and Dominica, there are large tracts of

unoccupied land, it is possible that this may be done to advantage, and, if so, arrangements with this object should certainly be either made or facilitated by the Governments concerned. But such action, though under any circumstances desirable, can hardly be rapid or on a scale large enough to absorb more than a comparatively small number of the surplus population of Barbados.

236. In the event, therefore, of a failure of the sugar industry, emigration can, at best, prove but an exceedingly partial and inadequate remedy for the distress which will be produced.

237. In Barbados, as in other islands, retrenchment in public expenditure is inevitable. The present cost of government and administration is on a scale which is out of proportion to the reduced resources of the community. In former days, when the sugar industry was flourishing, such a scale of expenditure was natural, and we have no wish to say that in Barbados, at any rate, it was not justifiable. But the Colony cannot afford it now. * * * * * *

240. In the maintenance of the sugar industry in some form and to some considerable extent lies the only hope of supporting in the island any large proportion of the present population of Barbados. We do not think that the maintenance of the industry, at any rate in some portions of the island, need be despaired of even in the present condition of markets.

241. Attention has already been drawn to the fact that large central factories do not exist in the island. In the present circumstances of the sugar trade there is no prospect that these will be established by private enterprise. The industry has no credit and capital is not forthcoming.

242. Application has already been made to the Government to enable central factories to be started. An Act was passed in 1895 to empower the Government to give assistance towards the establishment of sugar factories by public loans or guarantee. Her Majesty's sanction to this Act has hitherto been withheld for reasons which would, under ordinary circumstances, be conclusive. But the circumstances are not ordinary, and if relief is to be given to the sugar industry at all it appears to us that the establishment of central factories is the best form for it to take. * * * *

245. We, therefore, recommend that where owners of estates desire to combine, as it is stated they are still ready to do, Government aid should be given for the establishment of central factories.

246. It cannot be denied that in giving such aid either by loan or guarantee, the Government will run the risk of financial loss. On the other hand, if nothing is done to help the sugar industry, there is the certainty of great distress, of considerable expenditure to relieve it, and the probability of prolonged difficulty in finding employment anywhere for the population.

247. After taking these considerations into account we are of opinion that aid to maintain the sugar industry in Barbados may well be the least costly method in which the obligations of Government can be discharged. From the point of view of the welfare of the inhabitants it would certainly be the most satisfactory.

248. There are also special circumstances in the case of Barbados, which will tend to promote the success of the measures which we recommend. The labour supply is more abundant and effective than in any of the other colonies, and the soil of Barbados is especially well suited for growing sugar-canes with exceptionally rich juice. These two causes should enable central factories in Barbados to turn out sugar at an unusually low cost of production compared with that which is the average elsewhere.

249. In the evidence given by the planters, figures are brought forward which, taking into account both the increased quantity and quality of the yield from a central factory, show a prospect of a gain of 40 per cent. over the old muscovado process. And even if these figures be regarded as too sanguine, it seems to us certain that the gain would be very considerable and that it would be possible for central factories to be worked at a profit even when the price of sugar was too low to enable the present muscovado works to be remunerative. * * * * * *

253. It is essential under the circumstances that the capital required to set up central factories should be obtained on the cheapest possible terms, and we think the Imperial Government should find the money and lend it to the Colony at the same rate of interest at which it is borrowed. If the Government of Barbados is required to borrow the money on its own credit, the cost will be greater, and the liability of the Imperial Government will not be appreciably reduced ; if general distress arises, which the Colony is unable to relieve, it will be impossible for the Home Government to avoid giving assistance. The Colonial Government should, of course, be held responsible to the Imperial Government for both principal and interest.

254. We do not propose to attempt to settle all the details of the system under which the central factories should be worked, and will content ourselves with offering a few suggestions.

255. It does not appear necessary that the Government should insist, as a *sine quâ non*, on the estates being mortgaged for the repayment of the loan. To do so would raise many difficulties in connexion with the existing mortgages, and if the central factories prove unsuccessful the estates would be almost valueless, and the mortgages to Government on them worthless. It would be sufficient if the representatives of the estates were to undertake for a number of years to send the canes grown by them to the central factories. They might be paid a low price per ton for the canes as received, calculated in such a manner as to barely cover the cost of production, or nearly so. The next charge on the profits should be the interest and a sinking fund of one per cent. per annum. Any balance of profits remaining should be divided between the owners of the estates in proportion to the quantity of canes supplied by each ; but with the provision that of the profits in excess of a certain amount one half should go to the owners of the estates and one half be added to the sinking fund. When the loan has been repaid with interest the central factories should become the property of the owners of the estates.

256. The United States market is of especial importance to the trade of Barbados. It is from this market that the island chiefly gets its food supply ; it is to this market that practically the whole of its sugar is sent. * * * * * *

iii.—TRINIDAD.

259. We proceeded direct from Barbados to Trinidad, and landed at Port of Spain, the chief town of the Colony, on Wednesday, the 25th of February 1897. We held four public sittings in which we took the verbal evidence of 34 witnesses. In addition to other opportunities of which we severally took advantage to acquaint ourselves with the characteristics and condition of the island, we were enabled to inspect the country along the line of the Government Railway, and the extension now being constructed towards the Sangre Grande, and to visit a cocoa estate. We also visited Princestown, the Naparima district, and San Fernando, in the south of the island, drove through the principal cane-farming and sugar-producing district of the Colony, and inspected the Usine Sainte Madeleine, the largest sugar factory in the British West Indies, and the estates connected with it. We left Port of Spain on the 5th of March, and passed round the southern and eastern shores of the island in the Talbot on our passage to Tobago.

260. The island of Trinidad is situated close to the Venezuelan coast of South America. It has an area of about 1,120,000 acres, of which 800,000 acres are held to be cultivable. Of the cultivable land 434,000 acres are in the hands of private owners, and 366,000 acres are Crown lands. It is impossible to state the precise extent of land that is under cultivation at the present time, but there is still a large extent of cultivable land in the island unoccupied and uncultivated, and much of it is virgin soil.

261. The total population may be taken at 245,000, of whom fully two-fifths are immigrants from the East Indies or their descendants.

262. The soil is remarkably fertile, and varies in its character; some portions of the island are well suited for the production of sugar, others for cocoa, and on certain tracts near the sea cocoa-nut trees grow freely.

263. Trinidad exports about 50,000 tons of sugar yearly, and the exports of molasses and Angostura bitters, of which rum is the basis, are also of some importance.

264. The cocoa produced in the island bears a high reputation in the market; and its production has largely increased in recent years. There is also a considerable export of cocoa-nuts, and the island appears to be well suited for the production of coffee and fruits; the latter industries are of little importance at the present time.

265. There is a steady flow of population from the other West Indian islands to Trinidad, and notably from St. Vincent and Barbados. Some of the immigrants settle in Trinidad, others return to their homes after a time. There is also a considerable immigration of coolies from the East Indies, who are under indentures to serve for five years, and who after a total residence of 10 years become entitled to return passages.

266. At the period of our visit to Trinidad there was a certain amount of depression, due to the lower prices for cocoa and cocoanuts, as well as to the great fall in the price of sugar and

molasses; but the only apparent danger of a serious nature to the future prosperity of the island lies in the possible collapse of the sugar-cane cultivation.

267. The importance of this industry to the Colony is best shown by a consideration of the proportion which the value of the exports of sugar, rum, and molasses bears to the value of the total exports.

268. The average yearly value of the total exports of native products and manufacture is stated at 1,335,000*l*. during the period from 1881 to 1885, at 1,437,000*l*. during the period from 1886 to 1890, and at 1,447,000*l*. during the period from 1891 to 1895; in the year 1896 the value was 1,363,349*l*.

269. The corresponding figures for the exports of sugar, rum, and molasses during the same periods were:

Year.	Sugar.	Rum.	Molasses.	Total.
	£	£	£	£
1881–85	755,000	2,000	59,000	816,000
1886–90	715,000	3,000	51,000	769,000
1891–95	658,000	4,000	46,000	708,000
1896	700,000	6,000	36,000	742,000

The bitters exported in 1896 were valued at 34,000*l*., but this export would probably not be affected by any reduction in the area under sugar cane that is likely to occur.

270. It will be seen that, even at present prices, the sugar-cane industry furnishes quite one-half of the total exports of the Island of Trinidad.

271. The exports of cocoa have varied from a yearly average of 12,000,000 lbs., valued at 344,000*l*., in the period from 1881 to 1885 to a yearly average of 22,000,000 lbs., valued at 550,000*l*., in the period from 1891 to 1895. In 1896 the exports of cocoa came to 23,481,000 lbs., valued at 452,141*l*. There was a short crop of cocoa in 1896, and, owing to low prices, a portion of it was held back.

272. Asphalt from the well-known Pitch Lake of Trinidad is now an important item in the total export trade. The average yearly value of the exports of asphalt in the period 1891 to 1895 was 107,000*l*., and the Colony derives a revenue from this source of quite 30,000*l*. yearly.

273. The majority of the sugar estates in the island are provided with modern machinery, and may be said to be fairly equipped for producing sugar by the most approved processes. Out of a total export of 53,822 tons of sugar only 3,850 tons were muscovado sugar. The evidence laid before us was, however, to the effect that, owing to the low price of sugar, the industry was in danger of very great reduction, the Joint Committee of the Agricultural Society and the Chamber of Commerce expressing the opinion that the sugar industry was "undoubtedly in danger of extinction."

274. We specially requested the Acting Governor of Trinidad to favour us with his opinion on this question, and in his letter

of 31st March 1897 he stated that if the condition of the sugar industry as to prices and prosperity remained unchanged, there was a certainty of serious reduction, if not of extinction, of that industry. He estimated that, under present conditions, the industry would be reduced by one-half in three years. The extent to which a struggling industry will be reduced within a definite period must, from the nature of the case, be a matter of doubt, but we see no reason for dissenting from the opinion which Sir Courtenay Knollys has expressed on this point. * * * *

278. Apart from the recommendations which we have made in Part I. of our Report, in connexion with the subject of experimental cane cultivation, and the work of the Botanic Department, we are unable to offer any practical suggestion for the adoption of measures that could be taken in the Colony for improving the condition of the sugar industry. The public burdens on the industry are not heavy, and it is to some extent assisted at the expense of the general revenues, which bear a portion of the cost of introducing East Indian immigrants. * * * * *

280. It is recognised in the present day that the business of manufacturing sugar may often with advantage be separated from the actual cultivation of the canes. It is found convenient in many places that farmers should engage in the business of growing canes, and should sell the ripe cane to a central factory. This system is being tried, and with some success, in Trinidad, though a strong, and apparently well-founded, opinion has been expressed to the effect that, so far as can now be seen, the central factories in Trinidad can never depend entirely on canes so grown, but must, in order to ensure a continuous supply of canes for manufacture, possess a considerable amount of cultivation of their own. It was alleged that the presence of indentured coolies is essential to the maintenance of the industry, as only in this way could a reliable supply of labour be secured at all times.

281. The owners of sugar estates in Trinidad appear to be fully alive to the advantages of the cane-farming system, and anxious to introduce it as far as practicable. The general adoption of the system would be attended with many advantages, and we are of opinion that it is one which the Government might legitimately assist, where practicable, by providing means of communication to facilitate cane-farming in suitable localities. Both the Creoles and the East India immigrants prefer growing canes on their own plots to working as labourers on the estates, and they are willing to sell their canes at a price which is below the cost at which the estates can produce them.

282. In view of the probable reduction, in the immediate future, of the area of sugar-cane cultivation, and the serious effect which such reduction and the general depression of the industry must have on the welfare of the Colony, the chief remedial measures which we have to suggest are (1) the substitution of other agricultural industries for the cane cultivation; (2) the settlement of the surplus population on the land as peasant proprietors; and (3) the facilitating of access to foreign markets.

283. The practical work of carrying on new industries must be left in the hands of private persons, but, as we have already indicated in Part I., there are certain directions in which the Government can assist.

284. The Botanical Department in Trinidad should be entirely relieved of the business of ornamental gardening and the supply of ornamental plants, and should devote itself to the introduction and experimental cultivation of economic plants, and to attempts to secure improved varieties of such plants, and especially of sugar cane. It should comprise a branch for the teaching of tropical agriculture, and should form a centre from which teachers would be sent to give practical lessons in the cultivation of tropical plants and the selection of suitable localities for growing them.

285. Special and well-considered arrangements should be made for facilitating the settlement of the Creole and East Indian population as peasant proprietors on the Crown lands, and on any other suitable lands that may be, or may become, available.

288. We are, however, of opinion that special arrangements for the opening out of the Crown lands in small lots will not as a rule be popular with the persons who are interested in sugar estates in Trinidad. In such a Colony, with a sparse population and virgin soil waiting to be opened up, the sugar planters have experienced difficulties in getting at all times as much labour as they required at the prices which they were prepared, or could perhaps afford, to pay, and they have not looked with favour on any policy having for its object the opening out of the Crown lands to the labouring population.

289. We regret that any recommendation of ours should aggravate, or have the appearance of aggravating, even temporarily, the difficulties under which they at present labour, and which, for the most part, are not due to any fault of theirs, but we feel that we have no choice in the matter. Whatever the consequences to individuals may be, the position of your Majesty's possessions in the West Indies at the present time is such that every possible opportunity should be given to the native population of earning their livelihood otherwise than on a sugar estate, and that they should not be forced to depend longer than can be helped on the maintenance of a single and precarious industry.

290. Trinidad would share in the advantages of the subsidised steamer service which we have recommended to facilitate access to other markets and provide means for the migration of labourers between the islands.

291. It would also appear to be possible to develop a trade of some importance between Trinidad and Venezuela. At present there is a special differential duty of 30 per cent. *ad valorem* against goods imported into Venezuela from Trinidad. We trust your Majesty's Government will be able to secure the abandonment of this differential duty. It would also be desirable that arrangements should be made to store foreign goods in bond in Trinidad, which might afterwards be exported to Venezuela. At present goods which are subject to *ad valorem* duty pay a duty of 5 per cent. if landed at Port of Spain, and this duty is not refunded on export, and the goods are also subject to the special differential duty of 30 per cent. when landed in Venezuela on the ground that they are imported from Trinidad. * * * * * *

295. In the meantime the Botanical Department in Trinidad should encourage the introduction and growth of the better descriptions of fruit, and give instructions as to the best means

of cultivation and of packing fruit for export. We are not without hope that in time it may be found possible to establish a large and profitable industry in fruit, to be sent from the West Indies generally to the New York and London markets.

296. The question of the probable financial position of the Government of the Colony in the immediate future is one of some importance. The taxation of Trinidad is not light; the total general revenue in 1882 was 396,282*l*., of which about 297,700*l*. was from taxation. In 1896 the total was 577,140*l*., of which about 438,000*l*. was from taxes, including 22,700*l*. from export duties and royalties on asphalt. Additional taxation could be imposed, and would bring in some revenue, but it is not desirable to impose additional burdens on the Colony unless in case of necessity. The expenditure of public money appears to have been on a liberal scale in past years, having risen from 403,871*l*. in 1882 to 594,462 in 1896, and though the conditions of the Colony may have justified such expenditure, greater economy will be necessary.

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301. If there is a great and sudden reduction in the sugar industry, there might be a considerable temporary expenditure in providing for labourers, and especially for East Indian immigrants. The expenditure would be very heavy if any large number of immigrants claimed, as they might do, to be returned to India at the public expense, but we are disposed to agree with Sir C. Knollys in thinking that there would not be any general desire on the part of the Indian coolies to return. It any case it will be more easy to provide at short notice for the settlement of coolies on Crown and other lands in Trinidad than it would be in British Guiana. There is, therefore, less probability of a sudden and overwhelming demand being made on public funds for return passages.

302. The question of the assistance given to immigration at the expense of the public revenue is one that requires careful consideration. We are of opinion that if any industry requires immigrants it should pay the whole cost connected with their introduction. It is argued that the introduction of immigrants is a benefit to the whole Colony, and that the whole Colony should pay a portion of the cost of introducing them. This view as to the introduction of immigrants being a benefit to the whole Colony is not held by those persons with whom the immigrants compete in the labour market, and if the argument were pushed to its logical conclusion it would follow that every industry should get a bonus from the State, as every industry is a gain to the whole community. It has, however, been pressed upon us by evidence which we cannot disregard, that at the present time, and under present conditions, indentured labourers are absolutely necessary to the carrying on of the sugar estates. It would be a calamity, not only to the owner of the estates, but to the general community, to take any steps that must have the effect of intensifying the existing depression, and, whatever our recommendation might have been if the question of State assistance to immigration were now raised for the first time, we are not prepared to say that such assistance should now be withdrawn. We are, however, of opinion that the number of immigrants to be

introduced every year should be reduced to the minimum that will suffice for the working of the existing estates, and that State assistance in aid of immigration should ultimately cease.

303. The system under which a large number of immigrants are allowed to settle in the West Indies retaining a claim to a return passage, and without any provision being made beforehand to meet the burden, if it should arise, is a dangerous one. If the sugar cultivation ceases it will be impossible to levy the cost from the estates, and in St. Lucia, where immigration has now ceased, the planters complain that they, in their present distressed condition, are paying for benefits which were received by a former generation.

304. On the whole, we are of opinion that, notwithstanding the critical state of the sugar industry, the resources of Trinidad will probably suffice to meet the claims against her if they are carefully husbanded, and if no delay takes place in the adoption of measures for enforcing greater economy in public expenditure.

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iv.—TOBAGO.

305. We received in Trinidad verbal evidence as to the condition of Tobago (which is under the same Government) from three witnesses specially qualified to speak on the subject. We reached Scarborough, the chief town of the island, on the afternoon of Friday the 5th of March, and during the next morning we took evidence from 13 local witnesses at the Court House, whilst Dr. Morris inspected as much of the island as could be visited in the day. One of the Commissioners devoted part of the day to the same object. * * * * * *

308. The chief industry was the production of sugar, but it has been a decaying industry for many years, and at the present time it appears to be on the verge of extinction. The only cane now grown on the island is cultivated by small farmers on the metayer system, and the cane is ground at some of the old, and old-fashioned, mills which still exist. The farmers who grow the cane complain that they are losing by it.

309. When the general depression of the sugar industry took effect in 1885 there was a collapse of that industry in Tobago, the people began to turn their attention to various minor industries, and they now export cocoa, cocoanuts, peas, corn, potatoes, plantains, poultry, eggs, cocoa-nut oil, cattle, goats, horses, pigs, and sheep. Their proximity to Trinidad enables them to find a market for many of the articles which we have just enumerated.

310. These articles, however, by no means compensate for the decay of the sugar industry, and many of the able-bodied inhabitants migrate permanently, or temporarily, to Trinidad in search of work. The rates of wages are not so low as in such an island as St. Vincent, but there is very little employment to be had. The nominal rate of wages appears to be maintained owing to the island lying close to Trinidad, where there is a demand for labour.

311. Complaints are made that even when work is obtained wages are not regularly paid, and that the labourers often have to accept payments in goods and do not receive cash.

312. The revenue of the island was 14,003*l.* in 1880, 14,175*l.* in 1883, and 11,826*l.* in 1885. After 1885 there was a great fall The revenue of 1886 was only 8,814*l.* and notwithstanding strict economy and severe retrenchment successive deficits were incurred, necessitating a loan of 5,000*l.* from Trinidad funds, and other temporary borrowing. Part of this deficit has been cleared off by careful administration, and the revenue had risen in 1896 to 9,321*l.*, the expenditure being 9,269*l.*, but the net deficit on General Revenue Account at the close of the year was still 4,047*l.* * * * * * *

315. The value of the total exports was 48,245*l.* in 1882, 38,437*l.* in 1885, only 18,892*l.* in 1886, and 39,526*l.* in 1889, which, owing to a large crop and high prices, was an exceptionally prosperous year for all the West Indian sugar-growing Colonies. After 1889 the exports again fell, but their actual amount cannot be given with complete accuracy, owing to the union with Trinidad. It appears, however, that in 1896 the exports to foreign countries were of the value of 9,336*l.*, whilst articles of the value of 10,360*l.* are stated by the Commissioner to have been sent to Trinidad. From these figures it might be inferred that the total exports from the island are now worth about 20,000*l.* a year.

316. The record of Tobago for the past 20 years is a gloomy one, but happiness is not synonymous with wealth, and the condition of the people is decidedly better than the figures we have given would appear to indicate. This result appears to be mainly due to the healthiness of the climate, and the fact that Trinidad provides a market close at hand for both produce and labour. Any severe and prolonged depression in Trinidad would, no doubt, re-act on Tobago.

317. As a remedy for the present state of things it was urged that one or two central factories should be erected. We cannot recommend this course. If large sugar factories cannot be worked at a fair profit in Trinidad, they are not likely to succeed in Tobago, and the condition of the island is not such as to justify the adoption of a remedy so expensive, and so unlikely to be a permanent success.

318. The island was united politically with Trinidad in 1889, but a separate account of revenue and expenditure is maintained, and an adjustment on account of import duties made. It is alleged that Tobago loses by the adjustment.

319. We recommend the complete amalgamation of Tobago and Trinidad, and the abolition of the separate account of revenue and expenditure. Tobago would then become a ward, or district, of Trinidad, and the two islands would have a common exchequer. To this measure objections would, no doubt, be raised locally, though we believe the majority of the inhabitants of Tobago are in favour of it. The owners of large tracts of land are afraid that financial amalgamation with Trinidad might lead to the tax on land being raised to the level of that prevailing in the latter island. We are unable to see why this result should necessarily follow, as Tobago, in its present condition, has a good claim for separate treatment in this matter. The traders seem to fear that amalgamation with Trinidad would reduce their business in connexion with the import trade, and possibly with the export trade.

This result might follow, but from the point of view of the general interest, no sound argument against the amalgamation can be based upon it.

320. Communication between the two islands should, as far as possible, be facilitated. If, as we have recommended a cheap, and regular service of steamers is established between Barbados and the southern islands, it may be arranged that Tobago shall participate in that benefit.

321. It also appears desirable that a Botanic Station should be established at Tobago, subordinate to the Botanic Department at Trinidad, and having for its object the attainment of the same ends. * * * * * *

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v.—GRENADA.

325. Grenada is the headquarters of the Government of the Windward group of Islands, which comprises also St. Lucia and St. Vincent. We arrived there from British Guiana on the evening of Sunday the 7th of February, and held two sittings, during which we examined 20 witnesses, on the 9th and 10th of the month. We visited several estates of a typical character and left the island early on the morning of the 11th of February, during which day we visited Carriacou, which is one of the small islands called the Grenadines, lying between Grenada and St. Vincent.

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327. The production of sugar for export has entirely ceased. So far back as the year 1882 the value of the sugar exported was only 20,000*l*. At the present time the sugar cane is grown to a small extent to meet the local demand for sugar and rum. The place of sugar has been taken by cocoa, the value of the exports of which in 1893 amounted to 281,004*l*. For a number of years the island was decidedly prosperous, owing to the high price of cocoa. But the price of cocoa fell in 1895 and 1896, and at the time of our visit to the island there was a considerable amount of depression. The value of the exports of cocoa in 1894 was 168,000*l*., and in 1895, 138,000*l*. Besides cocoa the Colony exports nutmegs, cotton, and other products of minor importance. * * *

333. Our attention was called to the rate of growth of the public expenditure, which was said to be excessive. The rate of growth has certainly been rapid, the total expenditure having risen from 42,895*l*. in 1882 to 60,382*l*. in 1896. Of the increase 5,188*l*. is due to additional expenditure on education, and 6,385*l*. to charges on account of the public debt, which now amounts to 101,123*l*., having been incurred mainly for the construction of roads, bridges, and waterworks.

334. There was a deficit on general revenue account of 1,183*l*. at the close of 1896, whilst among the assets of the Colonial Government there were included arrears of contributions due from parochial boards on account of loans amounting to upwards of 2,000*l*., much of which will probably prove irrecoverable.

335. There is at present a tax of 6*s*. per house levied in Grenada. The poorer classes in Grenada, like the poorer classes in most of the other West India islands, are improvident, and at a period of depression, such as that through which the Colony is now passing,

a demand for the immediate payment of 6*s.* in cash falls heavily on that portion of the population which possesses little in the way of property, and is not in the habit of making provision for the future.

336. From Mr. Leslie Probyn's memorandum of 27th April it will be seen that in the present year the tax of 6*s.* was payable on 263 houses, which were, it is said, of such small value that the owners preferred to abandon them rather than pay the tax. Although those houses may have been of less value than 6*s.* each, it is unlikely that the owners possessed a second house, and the abandonment of their places of abode must have involved some hardship. We recommend that the local government be instructed to take into consideration the question of reducing, or repealing, this tax on the poorer classes of houses, though we are not prepared to recommend in the present circumstances of the West Indies that no direct taxation on houses should be levied.

337. The other recommendations which we desire to make in the case of Grenada are, to a great extent, the same as those which we have to make in the case of most of the West Indian islands, and may be briefly summarised as follows :—

(1.) The work of the Botanic Station should be extended, and it should be held responsible for agricultural instruction, for the introduction and experimental cultivation of tropical plants of economic importance, and for the supply of such plants, on payment, to the public.

(2.) The Government should, as far as may be practicable, encourage the settlement of the Creole population on the land as small proprietors. The Crown lands are of small extent, and are situated in the highest portions of the island. They are covered with forest, which it is of the utmost importance to preserve, and they are, therefore, not available for settlement. The question whether the Government should not purchase estates with the view of re-selling them in small lots may fairly be raised in connexion with Carriacou, where it is of special urgency, as that island is in a very depressed condition, whilst the medical officer states that "most of the estates here are "owned by absentee proprietors, who demand rents "that are much too high under existing circumstances."

(3.) Grenada will participate in the arrangements which we have proposed in Part I. for securing cheap and regular communication between the islands by means of small subsidised steamers.

(4.) The cultivation of fruit in Grenada should be encouraged, and the best kinds should be supplied from the Botanic Station. We do not recommend that any special attempt should be made at the present time to start a fruit trade between Grenada and New York, but we have made a recommendation of this nature in the case of St. Vincent and Dominica, and if the experiment should prove successful there is no reason why it should not in time be extended to Grenada. It would greatly facilitate such extension if in the meantime Grenada were placed in a position to grow suitable kinds of fruit in sufficient quantities. * * * * * *

340. In Carriacou, as in St. Vincent, we do not hesitate to recommend expropriation by process of law, after payment of reasonable compensation, in the case of the owner of any estate which has practically ceased to be cultivated, if such estate should be suitable for settlement in small lots, and should be wanted for that purpose, and if terms for its sale to Government could not otherwise be arranged. * * * * * *

vi.—ST. LUCIA.

343. St. Lucia has an area of 152,000 acres, of which about 114,000 acres are cultivable. Of the cultivable land about one-half belongs to private persons, the other half being Crown lands. The island contains many lofty ridges and peaks, separated by deep valleys. The valleys are fertile, but not so healthy as the uplands. The rainfall is ample. Only a small portion of the total cultivable area is actually under cultivation, and one-third of the island is covered with forest. There is a population of about 46,000; the people speak a French *patois*, and the educational system is very defective. With the exception of the sugar-cane cultivation, agriculture is backward. There are about 2,500 East Indians in the island.

344. For the three years, 1882, 1883, and 1884, the average yearly value of the total exports was 194,000*l*., and of the imports 150,000*l*. For the period from 1894 to 1896 the corresponding figures were 113,000*l*. and 151,000*l*. The value of the imports and exports of coal are not included in these figures; as a coaling station has been established in St. Lucia, their inclusion would render the figures less trustworthy as representing the progress of the Colony. The value of the sugar, rum, and molasses exported in 1882 was 207,000*l*., and in 1883 was 190,360*l* At that time almost the whole of the exports consisted of the products of the sugar-cane. After 1883 there was a rapid fall, and in 1886 the value of the quantities of these articles exported was only 64,000*l*. Subsequently to that year there was some increase up to 1893, in which year the value was 95,000*l*. After 1893 there was a further fall, and the value for 1896 was only 63,000*l*. The only article of export of importance, which has largely increased in quantity, is cocoa. Of this commodity 302,000 lbs. were exported in 1882 and 1,136,543 lbs. in 1896, but the price of cocoa has been low in 1895 and 1896, and though the value of the export in 1882 was 10,104*l*., in 1896 it was only 15,403*l*., notwithstanding a more than threefold increase in quantity. Wood is also exported for fuel, and there is a small export of fruit. In recent years the exports of logwood have been considerable, and in some years very large. In 1893 and 1894 the exports were large, being valued at 37,752*l*. and 37,359*l*. respectively.

345. The trade in logwood is, however, subject to great fluctuations, and there has been a fall in price. In 1896 the quantity exported was 1,904 tons, valued at 4,284*l*. In 1893 the logwood exported was valued at 6*l*. per ton.

346. The quantity of sugar exported in the present day is less than half what it was in 1882. The exports of rum are not of importance, and the exports of molasses have fallen off largely in quantity, and still more in total value.

347. When the sugar industry began to go down in 1884, the people turned, to some extent, to the cultivation of small plots of land on their own account. There is now a large number of persons employed in this way; some on plots which they have purchased from private owners, some on Crown land plots, some on land for which they pay rent or which they cultivate on the metayer system. A good many are believed to be squatters on Crown or other land, to which they have no title. * * * * *

349. The production of muscovado sugar for export has almost ceased. Only 494 tons of muscovado were exported in 1896, as against 3,055 tons of sugar made at central factories. About 30 estates which used to produce sugar have been abandoned in the last 10 years. Those which still produce sugar are either in the possession of the central factories, or send their canes there. About 70 peasant proprietors produce a small quantity of sugar.

350. The central factories do not appear to be flourishing. In good seasons they can apparently hold their own, but good seasons cannot be expected every year. The establishment of the Cul-de-Sac Factory was assisted by the Government, which borrowed 40,000*l.* for the purpose. Of this sum, 30,000*l.* was borrowed in the period 1874 to 1877, and 10,000*l.* in 1887. This money has been lost and the factory sold, but the persons who bought the factory, for a comparatively small sum, are believed to be working it at a profit. The population is in a very depressed condition, but actual starvation is not to be feared, as food sufficient to support existence is easily raised and land is obtainable. The island suffered greatly from a storm in 1894, and wages were reduced from 30 to 40 per cent. about two or three years ago. There are still a few indentured immigrants, the last batch of 155 having been brought to the Colony in 1893. The rates of wages now paid to the immigrants are not as high as those to which they are entitled by their agreements. It is not likely that more coolies will be applied for, and if applied for they should not be sanctioned.

351. The revenue of the Colony is hardly adequate to meet its expenditure, although some taxes are in force which are open to much objection, and additional expenditure is much needed for the repair and maintenance of roads as well as for other purposes. The general revenue rose from 38,953*l.* in 1882 to 56,590*l.* in 1894. In 1895, a year of general depression in the West Indies, it fell to 48,563*l.*, and a serious deficit was created. In 1896, by increase of taxation and owing to special receipts not of the nature of ordinary revenue, and not to be looked for in other years, amounting to 5,310*l.*, the receipts were raised to 55,331*l.* The expenditure in these three years was 54,400*l.*, 57,578*l.*, and 56,060*l.*, and the deficit on General Revenue Account at the close of 1896 was 5,088*l.* The Public Debt of the Island is 179,441*l.*, of which 95,881*l.* is due to expenditure on Castries Harbour, to enable it to be used as a coaling station.

352. Notwithstanding the gloomy picture which we have had to draw of the condition of St. Lucia, the island possesses certain resources which, if judiciously developed, may in time restore it to, at least, a moderate degree of prosperity, but the Colony requires, in a very special degree, careful and prudent as well as strong and resolute administration during the coming years. The establishment of a coaling station at Castries is a point in its favour. The number of vessels calling at the port has risen from 233 in 1887 to 435 in 1896. The quantity of coal shipped has risen in the same time from 17,758 tons to 44,816 tons. * *

361. The most important measure to be taken for the welfare of St. Lucia is the settlement of the people on the land. There is already a large number of persons who cultivate small plots, but we have no doubt that the number can be increased. Roads should be provided for the benefit of the small settlers, and arrangements made for giving them instruction in agriculture. This instruction can best be given in connexion with the Botanic Station, the operations of which should be extended in the way we have indicated in the case of the other islands. More suitable land for the purpose of experimental cultivation in connexion with the Botanic Station is very much required. St. Lucia will, of course, share in the benefits of the scheme for facilitating communication between the different islands which we have recommended, if that scheme should be approved.

362. There is a law which provides for compulsory education, but the law is a dead letter, and could not be enforced. The general system of education for the children appears to be defective, the defects being, no doubt, largely due to want of money, and to the fact that the great mass of the population speak only a French *patois*, whilst the teaching is given in English. We can only recommend that special attention should be given to the educational system of the Colony, and reforms introduced as money can be made available. It would be a great gain to the people if they could be taught to speak English, and gradually weaned from the use of the present *patois*. It must take a very long time to carry any such reform into complete effect, but the matter should be steadily borne in mind, and the educational system so devised as to facilitate the change.

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vii.—ST. VINCENT.

363. We reached St. Vincent on the evening of Thursday, the 11th of February, and took evidence publicly there on the 12th, 13th, and 15th. We examined 33 witnesses out of a large number that offered themselves, and we received in this island an unusual number of letters and petitions, alleging distress amongst the labouring class, with a considerable proportion of direct requests for pecuniary assistance.

364. The area of St. Vincent is 83,115 acres, and of the small islands united with it 10,872 acres. The total area of the Colony is, therefore, 93,987 acres, of which one-third is worthless. There

is a central range of mountains running north and south, with spurs extending on both sides to the sea. The soil is fertile, the climate healthy, and the rainfall heavy.

365. The sugar industry has been in a decaying condition for years, and is now on the verge of extinction. No improvements have been introduced in the manufacture of sugar, and the sugar canes have in recent years suffered very severely from disease, this disease being in all probability due, to some extent, to want of effective cultivation.

366. No industry can be said to have taken the place of the sugar cane as the cultivation of the latter fell off. The second industry in point of importance is that of the production of arrowroot, but the price of arrowroot has recently fallen to such an extent as to add materially to the depression from which the island is now suffering.

367. There are very few small proprietors cultivating their own land. Of the total area 50,584 acres are included in 129 estates of not less than 100 acres each, while the extent of the Crown lands is estimated to exceed 25,000 acres. The Crown lands are situated on the high ground in the interior of the island, and a belt extending along the coast, and completely surrounding the island, is in the hands of private owners. Of the cultivable area not more than 8,000 or 10,000 acres are believed to be beneficially occupied by cultivation.

368. Wages are very low; they have been reduced in recent years; and there is a lamentable want of continuous employment. For some years the able-bodied males have been emigrating, leaving, in many cases, the women and children to shift for themselves. The population is decreasing, and the labouring classes are discontented.

369. In 1882 the value of the total exports of native produce was 149,910*l.*, and of the imports 152,332*l.*; for 1896 the corresponding figures were 57,436*l.* and 60,563*l.* The values of the exports of sugar, rum, and molasses in 1882 were 94,847*l.*, 11,112*l.*, and 7,552*l.* respectively, while the corresponding figures for 1896 were only 19,544*l.*, 1,806*l.*, and 2,653*l.*

370. The Public Revenue in 1882 was 31,565*l.*, and in 1884 34,509*l.* Since that year there has been a falling off, the revenue for the last three years having been 28,574*l.*, 25,460*l.*, and 26,487*l.* Notwithstanding retrenchment in establishments, a deficit of 4,816*l.* had accrued at the close of 1896, to which should be added 1,707*l.*, which appears in the Colony's financial statements as due from the "Crown Lands Fund," but which is irrecoverable. The island has a public debt of 19,380*l.*, and further borrowing of 3,500*l.* for the construction of roads has been sanctioned.

371. The prospect which the Colony has now to face is the practical extinction of the sugar-cane cultivation within a very brief period, except in so far as it may be found profitable to continue it in order to meet the local demand for sugar and rum.

372. We do not think that under the conditions that are likely to prevail in the future the production of sugar for export on a large scale could be permanently carried on in St. Vincent unless modern machinery were set up, and the most approved processes

of manufacture adopted. Such a change would involve the starting of large factories, for which one or two places in the Colony are not unsuited. But there is no prospect of any such improvements being carried out by private persons, and we hesitate to recommend that the State should find the money for what must in the case of this Colony be regarded as a very doubtful experiment.

373. In view of the approaching extinction of the sugar industry in St. Vincent, and of the fact that there is no prospect of private enterprise establishing other industries on a sufficiently large scale to afford employment to the labouring classes, the problem of providing for these classes becomes one of extreme urgency, and is beset with difficulties.

374. We have already made a general recommendation that the settlement of the Creole population of the West Indies as cultivating proprietors should be recognized as the settled policy of the Government of the different Colonies, and we see no reason to depart from that policy in the case of St. Vincent. On the contrary, it seems to us that, whether the sugar industry is maintained or disappears, it is absolutely essential in the interests of the native population that their settlement on the land should be facilitated ; in no other way does it seem to us to be possible to maintain even the most moderate degree of prosperity in St. Vincent. * * * * * *

377. There are round the sea-coast thousands of acres of fertile land in the hands of private owners uncultivated, and likely to remain so. The holders of these lands appear to be unwilling to sell them in small lots or at a reasonable price, and are unable to cultivate them. Under the circumstances, we have no hesitation in recommending that suitable portions of these lands be acquired by the State and made available for settlement in small plots. If suitable lands cannot be obtained by private agreement with the owners, powers should be taken by the Government to expropriate them on payment of reasonable compensation. The condition of St. Vincent is so critical as to justify the adoption of prompt and drastic measures of reform. A monopoly of the most accessible and fertile lands by a few persons who are unable any longer to make a beneficial use of them cannot, in the general interests of the island, be tolerated, and is a source of public danger. * * * * * *

379. Another measure which we recommend is an attempt to establish a fruit trade with New York, such, though on a smaller scale, as that which has proved of such benefit to Jamaica. In this enterprise Dominica may with advantage be associated with St. Vincent. We have already recommended that a guarantee for five years be given for a fruit steamer to run from St. Vincent and Dominica to New York, to be extended, if necessary, for another period of five years, on condition that each island undertakes to put at least 2,000 acres under banana cultivation. It is, however, probable that private persons will be found willing to make an agreement to this effect when they understand that proper means of communication may be depended upon for at least ten years.

380. As it appears likely that, at least in St. Vincent, a considerable charge for the relief of distress would have to be borne

by public funds if occupation cannot be found for the labourers, it would not be unreasonable, if private enterprise is not forthcoming to guarantee the requisite cultivation, for the Government to make arrangements to this end; and, if the recommendations with regard to the purchase of land in St. Vincent and the settlement of cultivators thereon are carried out, it may be made a condition of occupancy that a certain area of each holding shall be planted and cultivated in bananas. At any rate, it is estimated that a total cultivation of 4,000 acres in the two islands must be secured in order to produce sufficient bananas to make it worth while to run a steamer. If a considerable number of cultivators can be settled on the land, we have no doubt that they also will grow bananas and materially extend the industry. * * * *

385. In conclusion, we desire again to draw special attention to the very critical position of affairs in St. Vincent, where a population, which is not possessed of property in any form, and has no land on which it can labour, is threatened with the almost complete loss of the scanty amount of intermittent employment on very low wages which it at present manages with difficulty to secure.

386. No time should be lost in introducing any measures which it may be deemed advisable to adopt, with a view to applying a remedy to the condition of affairs which we have described. It is possible that the collapse of the sugar industry may come so suddenly as to make it necessary to find temporary employment at the public expense for some portion of the population. In such case the cost would have to be borne by the Imperial Exchequer, as it does not seem possible for the Colony to find the money.

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viii.—DOMINICA.

387. We arrived at Dominica, direct from St. Lucia, on Thursday, the 11th of March, and on the 12th and 13th of March held sittings at Roseau, the chief town of the island, when we examined 14 witnesses. One of the Commissioners and Dr. Morris visited the Layou Flats, a promising district, which will be presently referred to.

388. Dominica is one of the Presidencies of the Federation of the Leeward Islands, with which we shall deal in the order in which we reached them. The seat of government is at Antigua.

389. The population, according to the census of 1891, was 26,841. This was 1,370 less than in 1881. The total area is 186,240 acres, of which only 60,000 acres are said to be in private hands. The whole of the remainder is therefore Crown land, and it is estimated that 80,000 acres of Crown lands are suitable for cultivation.

390. In 1882 the total value of the exports was 61,297*l*., and in 1896 the total exports were valued at 48,973*l*. The value of the sugar, rum, and molasses exported in 1882 was 44,494*l*., and in 1896 only 7,554*l*. That is to say, in the last 15 years the exports of sugar, rum, and molasses have fallen from 71 per cent. to 15 per cent. of the total value of the exports.

391. This fact alone would be sufficient to place Dominica in a different category to others of the Leeward Islands, such as St. Kitts, Nevis, and Antigua, in which the sugar industry has struggled against depression and retained its position as practically the only industry of the Colony.

392. In Dominica the cultivation of sugar has already given way, doubtless because the processes both of cultivation and manufacture were more primitive and wasteful than in other places. The industry was never on so strong a footing in Dominica, and has therefore succumbed sooner. * * * *

395. Since, however, Dominica has never been so great a sugar-producing Colony as most of the others, and sugar exports now only form 15 per cent. of the value of the whole, it is unnecessary to discuss the question of taking special measures as far as Dominica is concerned to re-establish the sugar industry there.

396. It is with the development of the other industries that the Colony will be mainly concerned in future. In this direction there is not only very good ground for hope, but considerable progress has already been made. The value of the exports of cocoa have risen from 6,375*l*. in 1882, to 13,453*l*. in 1896; of limes and lime juice from 5,102*l*. to 14,851*l*.; of essential oils from 295*l*. to 5,012*l*.; of fruit and vegetables from 607*l*. to 1,348*l*.; and of coffee from 321*l*. to 967*l*. in the same period.

397. But this is not enough. If Dominica is to be self-supporting, if an efficient Government is to be provided for out of its revenue, and the people are to be prosperous, or even comfortable, these industries must extend still further; and there is, happily, no reason why this should not be the case.

398. The great extent of the cultivable area of Crown lands has already been noticed. These lands are undeveloped; they are mostly covered with timber, much of which is said to be valuable. Care, no doubt, ought to be taken not to create increased risks of landslips or floods by allowing too much of the highest lands to be deforested, for the rainfall in Dominica is heavy; but even allowing for the utmost caution in this respect, there is a great extent of land, especially in Layou and Sara flats, which may be cleared and cultivated. The soil of much of this is believed to be very rich and fertile, and the appearance of such patches as have been cultivated confirms the probability of its being so.

399. Some of this land ought to be disposed of under proper regulations to peasant cultivators, and some of it may prove attractive to investors of capital or persons who are in a position to occupy and cultivate estates of their own. The Government of the Colony will have to be guided by circumstances in the disposal of it; it is not possible, under present conditions, to say what opportunities will arise which may lead to its being occupied and cultivated. At the time of our visit all sale of Crown lands had been temporarily suspended owing to negotiations which were then pending for a large concession to a company. We believe these negotiations have fallen through, but in any case the sale of Crown lands to cultivators in suitable localities ought to be resumed. * * * * * *

404. There is enough labour in Dominica for its present industries, but it is to be hoped that these industries will increase, and, if so, their needs will soon outgrow the capacity of the present labour supply. By the time, however, that this takes place there will, we fear, be only too many persons in other islands in want of employment, and it should be easy to import many labourers from them. * * * * * *

409. The present condition of Dominica is certainly one of depression, and it will need assistance from the Imperial Government. This may be given as part of a general scheme for subsidised steam communication between the islands, and of a special scheme for opening direct communication between St. Vincent, Dominica, and New York.

410. Dominica will also share in any assistance which may be given to the system of botanic institutions in the West Indies. In addition to this the island should have some assistance from Imperial funds for making roads, which are essential to its progress. Such help need not be very costly, and need not be grudged, since Dominica may, if such assistance is given, be expected to attain a state of comfort, or even prosperity, and its capabilities and prospects are decidedly better than those of any other of the Leeward Islands.

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ix.—MONTSERRAT.

411. We reached Montserrat on Monday evening the 16th of March, and on the 17th examined 11 representative witnesses and received written statements, and gained other information as to the condition of the island, which we quitted on the following morning.

412. The population of the island at the last census was 11,762. It is now estimated at 12,500. The area is about 25,000 acres, of which it is estimated that about 15,000 acres are cultivable. These are all in private hands, and there are no Crown lands. About 10,000 acres are said to be actually under cultivation. The area under cultivation in sugar is approximately estimated at 6,000 acres, or about three-fifths of the total cultivated area. There are many small holdings, besides large estates.

413. The value of the exports of sugar and molasses in 1882 was 31,142*l*. In 1896 the value had fallen to 14,967*l*. Hardly any rum is exported. The value of the total exports for 1882 was 38,120*l*., and in 1896 was 24,213*l*. It will be seen, therefore, that while in 1882 the exports of sugar and molasses amounted to 81·69 per cent. of the value of all the exports of the island, this proportion had fallen in 1896 to 61·81 per cent.

414. All the sugar estates produce muscovado sugar only; the industry has ceased to be profitable, and the prospects of it are no better than in neighbouring islands. The island is intersected by deep ravines, which would make the establishment of central factories difficult. Even, therefore, if the prospects and credit of the industry generally were to revive, the industry in Montserrat would in the long run be severely handicapped by the competition, in other parts of the world, of large central

factories, which either could not be established or could not be economically worked in Montserrat. It is accordingly necessary to consider what industries can take the place of sugar in supporting the population and providing a revenue for the island.

415. The statistics of exports show that during the last 15 years progress has been made with industries other than sugar. Such advance in this respect as there has been is greatly due to the work done by the Montserrat Company, the manager of which informed us that the company employs 1,200 labourers for the three months of crop time, and from 700 to 800 for the rest of the year. The company is stated to have 1,247 acres under cultivation in limes, and as a result mainly of this a considerable export of lime juice has arisen, the value of which has amounted to 10,300*l*. in one year, and may be said to average some 6,000*l*. in annual value. The lime industry in Montserrat, however, has of late suffered severely from blight.

416. Other exports of comparative importance are arrowroot, the value of which has doubled since 1892 notwithstanding a fall in price, and amounted to 669*l*. in 1896; and coffee, which reached a value of 789*l*. in 1896, having only begun to be an export of importance in 1894 Papaine, essential oils, and bay oil also appear upon the list of exports.

417. Reference to Dr. Morris's report will show that there are other forms of cultivation, such especially as vanilla, ginger, and fruit, which might be started or profitably developed, and the preserving establishment recently set up by the Montserrat Company may give some encouragement in this direction. * * *

419. Montserrat can only be developed and supported by variety of produce, and for this two things are essential—a good Botanic Station, capable of supplying plants and giving instruction, and access to markets. Both these needs have been dealt with in connexion with other islands in the general report, but it should be noticed that the work of the Botanic Station, which might have been made very useful in Montserrat, has been discontinued owing to lack of funds—an illustration of how the island is being pinched by the failure of the sugar industry, and of how, just as its need is greatest, it becomes impossible for it to provide unaided the means which are essential for overcoming its difficulties.

420. It will be seen, both from Dr. Morris's report and from the statistics already referred to, that the prospects of other industries than sugar are in a comparatively more advanced and more hopeful position in Montserrat than in St. Kitts and Antigua. Mr. Baynes, the Commissioner, drew our attention to the need for capital to develop new industries, a point which has already been dealt with. * * * * *

423. The revenue is falling off, though the Customs and other duties have been increased, and the limits of taxation have apparently been reached. Since 1890 an increase in the land tax has taken the place of export duties, which were abolished. * *

425. The increase in the ordinary expenditure is mainly due to increase of charges on account of debt and to increased cost of education.

426. From 1891 to 1894, 14,500*l*. was borrowed for public works, and in 1896, 3,500*l*. was borrowed on the security of Treasury

debentures, "partly to meet deficiencies of revenue, and partly to cover expenditure on loan works in excess of the amount raised"—or authorised. These works consisted chiefly "of new roads and improvements of old ones, improvement of the streets of the town, extension of the jetty, a new hospital," &c.

427. The new roads, as well as those previously existing and absolutely necessary for the traffic of the island, were severely damaged by the flood of November 1896, which in other ways also has caused much distress in the island. The Colonial Engineer of Dominica, who reported upon the damage done, and a copy of whose report was supplied to us, has recommended that no attempt be made to repair or maintain the greater part of the new roads; but it is estimated that the cost of indispensable repairs to the other roads and to those portions of the new roads which it is advisable to keep open will be about 2,650*l.*, whilst an expenditure of 500*l.* will be required to repair the Plymouth waterworks; and the present jetty, which, though recently constructed, is already in a precarious state, must, if shipping facilities are to be maintained, be replaced at a cost of not less than 1,500*l.*

428. It will not be possible, with such a fall in the revenue as must be anticipated, for the Presidency of Montserrat to meet this expenditure, and to repay the short-term debentures for 3,500*l.*, that represent its floating debt, except by sacrificing a considerable proportion of the already very limited expenditure devoted to education and medical relief.

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x.—ANTIGUA.

429. We reached Antigua, the seat of the Government of the Leeward Islands, on the morning of Thursday, the 18th of March, and remained in the island till Monday, the 22nd of the same month, taking evidence from 25 witnesses, receiving written statements, and visiting several districts of the island. The poverty of many of the inhabitants was forcibly brought to our notice during these excursions, and by our residence in St. John's, as well as by the written and oral appeals made to us for assistance.

430. The population of Antigua is 36,119. The area is about 67,000 acres, of which 15,603 are under cultivation in sugar. The number of properties on which sugar is grown is given as 120, of which 41 are those of peasant proprietors or renters of less than 50 acres.

431. The value of the total exports of the produce of the island in 1882 was 262,145*l*, in 1896 this had fallen to about 127,000*l*. The value of the exports of sugar and molasses for 1882 was 260,197*l*, and for 1896 it was £118,634, being 96 per cent. and 91 per cent. of the total exports for these years respectively. Hardly any rum was exported from Antigua during this period, and none has been exported since 1885. From these figures it will be seen how entirely Antigua is dependent upon its exports of sugar and molasses, and how great the fall in the value of these has been.

432. There are no large central factories, and, except at one estate, which has a vacuum pan and centrifugals, sugar is made

by the muscovado process, which in Antigua, as in Barbados, remained profitable, owing to the special fitness of the soil for producing a cane juice yielding a rich and valuable quality of molasses peculiar to these islands and St. Kitts, and having, until recently, a special market value. There has, also, during recent years, been improvement in the cultivation of the cane, so that a larger amount of sugar has been produced, though the area under cultivation has diminished. In 1882 the amount of sugar exported was 12,769 tons; in 1896 it was 13,714 tons. The great bulk of this export goes to the United States market.

436. In Antigua, as in all places which depend upon the export of muscovado sugar, the great fall in the demand for molasses has been an additional blow to the sugar industry. In 1882 the quantity of the molasses exported was 8,369 puncheons, valued at 41,845*l*, in 1896 it fell to 6,648 puncheons, of the value of only 7,479*l*., and it was stated in the memorandum quoted above that there has lately been an inability to sell the whole of the crop.

437. All that has been said under the head of Barbados respecting the prospects of the muscovado industry applies with equal force to Antigua. * * * *

439. The prospects of the sugar industry might, no doubt, be improved by the erection of central factories. There is no chance whatever of this being done by private enterprise, and, if done at all, it must be done with the assistance and at the risk of the Government. We cannot advocate this course in the case of Antigua with as much confidence as in that of Barbados. Antigua is more liable to drought, and some difficulty might be experienced in securing a sufficient water supply for large factories; moreover, the plantations have not yet recovered from the attacks of disease to the same extent as they have in Barbados. There are, however, suitable places in Antigua for the establishment of such factories, and if the success of the experiment in Barbados is such as to justify its adoption elsewhere, Antigua may be regarded as the next best field for it.

440. In the event of a failure of the sugar industry the condition of Antigua will be one of very great distress and difficulty. No other industries can supply the place of sugar. During the bad season of 1895 there was a considerable export of logwood, but the price of this product has fallen of late, and the supply in Antigua is said to be, for the present, exhausted.

441. Some attempts have been made, not on a very large scale, to grow pine-apples, and with success. They are sent to the London market, but the difficulty of transport and the cost of freight have prevented any considerable expansion of this industry. No doubt fruit of other kinds, of good quality, might be grown. Indeed, it may fairly be said that no other industry, except sugar, has had a trial, and on this point the evidence of Mr. Tillson, the Curator of the Botanic Station, may be referred to. Want of knowledge and want of means of communication with the great markets have stood in the way of all minor industries.

442. In Antigua, as in several other islands, the Government must, to meet the altered circumstances, take steps—

1. To promote the settlement of the labouring population on the land as peasant cultivators. Some Crown lands are

available for this purpose, and the low price of sugar has made it necessary to abandon some sugar estates, and may bring others into the market.

2. To provide more facilities of communication by steamer with other islands.

3. To encourage and extend the work of the Botanic Station.

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444. Skerrett's Reformatory School, and the farm attached to it—of the expense of which some witnesses complained—are, no doubt, useful establishments if the Presidency is able to afford their cost, which in 1896 was 938*l*. net, for the combined institutions, and they appear to be well managed.

445. The public revenue, however, is not equal to the present rate of expenditure. There have been of late years, successive deficits, which have given rise to a floating debt on General Revenue Account, now amounting to upwards of 20,000*l*., in addition to the funded debt of 138,000*l*. These deficits have been met by temporary borrowing, though the Customs duties have been very much increased. There is already a land tax of 5*s*. an acre on land planted in sugar-cane—which the industry is not in a condition to bear—1*s*. on other cultivated land, and 1*d*. on other lands, and though additional revenue has become necessary, it is not easy to see how fresh taxation can be imposed.

446. If the sugar industry fails, the future of Antigua will be more gloomy than that of either St. Vincent or St. Lucia. The capabilities are less, the liability to drought and hurricanes is greater. The scale of public expenditure will have to be progressively reduced, the standard of living will become very low, and the population will probably diminish. In the meantime the island must for some years be quite unable to provide for its own administrative needs and be a burden upon Imperial resources.

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xi.—ST. KITTS–NEVIS.

447. St. Kitts and Nevis lie close together and form one Presidency under a single Administrator. We arrived at Basseterre, the chief town of St. Kitts, on the evening of Monday, the 22nd of March. We took evidence, during the 23rd and 24th, from 22 witnesses, and on the 25th we visited the island of Nevis, and after returning to Basseterre, left the same evening for Jamaica.

448. The estimated present population of St. Kitts is 31,900, and of Nevis, 13,700. The total area in acres of St. Kitts is 41,851, and of Nevis, 32,000; of these, 18,385 acres in St. Kitts, and 6,868 acres in Nevis, are stated to be beneficially occupied by cultivation: and it is said that all land that could at present be cultivated with profit is utilized. The total area of cultivable land is, however, given as about 29,000 acres for St. Kitts, and 24,000 for Nevis.

449. There is daily communication by steam ferry between Basseterre, the capital of St. Kitts, and Charlestown, in Nevis, a distance of about 14 miles.

450. As in Antigua, the population is dependent upon the sugar industry, the products of which are practically the only export of the island. In 1882 the value of the sugar exported was 283,108*l.*, of rum 5,980*l.*, and of molasses 36,373*l.*, making a total of 325,461*l.* In 1896 the corresponding figures were sugar 96,342*l.*, rum 1,856*l.*, molasses 7,047*l.*, making a total of 105,245*l.* The value of the imports has fallen from 237,289*l.* in 1882 to 157,087*l.* in 1896.

451. The description of sugar manufactured is almost entirely muscovado. The amount in 1882 was 18,601 tons, and in 1896 14,822 tons, the difference in quantity being due to difference in seasons, rather than to any diminution of the area under cultivation. From 1884 to 1896 an average of about 400 tons of vacuum pan sugar was manufactured on one estate chiefly for local consumption.

452. At present the only markets for the sugar produced are the United States, and, to a small extent, Canada. * * * * *

457. We inquired as to the reason of this difference between St. Kitts and Nevis as to the ownership of land, and find that it is attributed to sugar estates in Nevis having been broken up and sold in small lots in previous years. Mr. Roden, the District Magistrate of Nevis, stated that the peasant proprietor's land was formerly purchased from the estates.

458. In St. Kitts, estates have not yet been broken up in this way, probably because the soil has been richer and cultivation more profitable than on the estates of Nevis, referred to. Now, however, that the sugar industry is failing, the condition of the people in St. Kitts is worse than in Nevis, and the prospect of distress, leading perhaps to disturbance, when the abandonment of estates (as already decided) takes place, is very serious. * *

460. We desire to draw attention to the evidence given by Mr. Kortright, the Superintendent of Public Works, with reference to the deforesting of the mountain lands. In his opinion, it is in consequence of this that the occurrence of destructive floods is almost yearly becoming more marked, and is already impoverishing the upper lands. It would be very desirable to take measures to prevent the deforesting of land above a certain altitude. Some of such land is no doubt included in the area returned as cultivable. * * * * * *

466. If there is no improvement in the sugar trade the revenue in St. Kitts will fall very considerably. Neither the official staff nor the general public expenditure can be very suddenly reduced in view of the impending distress, and for some years deficits may be expected to continue and even to increase. During this period St. Kitts-Nevis, as well as Antigua, must be dependent upon the British Government.

467. We desire, however, to express the opinion that there is room for some economies in the Government of St. Kitts-Nevis, and that efforts should be made to approach to a more simple and inexpensive form of Government throughout the Colony of the Leeward Islands than that which it has been deemed necessary or desirable to maintain in the days of their greater prosperity.

xii.—JAMAICA.

468. We arrived at Kingston, the capital of Jamaica, on Sunday, the 28th of March, and remained there or in the immediate neighbourhood until the 10th of April. We held public sittings on five days, and examined 63 witnesses; and also took other means of making ourselves acquainted with the condition and prospects of the island. On the 10th April we proceeded by the recently completed railway to the town and port of Montego Bay, at the north-west extremity of the island, and embarked on the Talbot, in which we were taken on the 12th of April to Port Maria on the north coast. At Port Maria the Custos of the parish, Dr. Pringle, had made arrangements by which we were enabled to drive through a considerable tract of country which was formerly under cane, but has now been successfully brought under banana cultivation.

469. In the evening we rejoined the Talbot at Port Antonio, and remained there until the morning of the 14th, when we finally left Jamaica, after a stay of 17 days in the Island.

470. During our stay at Port Antonio we visited some important banana plantations, and obtained much information regarding the banana industry from various persons, especially from Captain Baker, one of the early and successful originators of the trade. Port Antonio, it may be noted, is now, owing to the banana trade, a thriving place. It is the principal port of departure for steamers carrying fruit to the United States.

471. Jamaica lies at a considerable distance from the other British West India islands, and forms one of the group of the Greater Antilles, which comprises Cuba, Haiti, and Porto Rico, all of which are foreign. The island is only 310 miles from the Continent of America, 90 miles south of Cuba, and 100 miles west of Haiti. It has little connexion or trade with any of the other British West Indian Colonies, but has very frequent communication and a good deal of trade with the United States, as well as a fair amount of trade with the United Kingdom and Canada, but the trade with the United Kingdom has diminished of late years, whilst that with the United States has largely increased.

472. The island has an area of 4,207 square miles, and is, therefore, one-fourth larger than all the other British sugar-producing islands taken together, and although British Guiana, on the mainland of America, is about 25 times as large as Jamaica, it had only, in 1891, a population of 278,328, as compared with 639,491 in Jamaica.

473. Of the total area, 330,000 acres are still in forest, 80,000 acres consist of swamps and rocky or other useless lands, and 693,694 acres are returned as occupied by cultivation. A large portion of the cultivable land is situated at a considerable height above the sea and no less than 1,133,600 acres of the land that is classed as cultivable are situated at or above an elevation of more than 1,000 feet. Coffee is grown at various heights up to 5,000 feet, and the mountain coffee is much prized, being sold at from 5*l.* to 6*l.* a hundredweight. Owing to the variety in elevation and the great fertility of the soil, nearly all tropical and subtropical plants can be cultivated with success. The island is

however, subject to severe droughts, and occasionally to floods, and at the time we visited Jamaica an exceptionally severe drought was causing much distress and loss.

474. Whilst British Guiana, which may be considered at present to depend entirely on the cultivation of sugar, has 66,908 acres under cane, there are 30,036 acres under similar cultivation in Jamaica; but, whereas most of the other Colonies are almost entirely dependent on sugar-cane, Jamaica produces, besides coffee, logwood, bananas, oranges, pimento, ginger, cocoa, cocoa-nut, tobacco, and other articles of export, the value of which, as shown in the returns of 1895-96, amounted altogether to about 1,415,000*l.*, as against 360,059*l.*, the value of the exports of sugar, rum, and molasses.

475. Jamaica is, therefore, in a better position to meet a falling off in the sugar trade than any of the other West Indian Colonies, except Grenada, which has ceased to produce sugar except for local consumption, and is supporting itself entirely by other products.

476. Nevertheless, the fall in value of sugar products exported has told heavily on Jamaica, and any further fall will seriously affect the welfare of a considerable body of planters and of 39,000 persons who are stated to be directly concerned in sugar cultivation, whilst many others are more or less dependent on the sugar industry, such as the cattle breeders and persons connected with the shipping interest.

477. The estimated population in March 1896 was 694,865. According to the census of 1891 the population, which was then 639,491, comprised 14,692 whites, 121,955 coloured persons, 488,624 blacks, 10,176 East Indians, 481 Chinese, and 3,623 of miscellaneous races.

478. If the present estimate of the population is correct, there has been an increase of 55,374 in the five years ending in March 1896, following an increase of 58,687 in the ten years from 1881 to 1891. The population is, no doubt, rapidly increasing, but the increase is much greater among the black and coloured population than among the whites. The coloured (or brown) population has much increased of late years in numbers and in influence.

479. It is interesting to note, as a matter of comparison, that at the time of the emancipation, in 1834, the population was made up of 311,070 slaves, 15,000 whites, 40,000 coloured people, and 5,000 free blacks.

480. The revenue administered by the Government of Jamaica, which in 1881-82 was 556,635*l.*, had risen to 807,893*l.* in 1895-96, but of this latter amount 161,790*l* consisted of what are styled appropriated revenues, derived from taxation for local purposes, 80,587*l.* of the amount being devoted to roads, and 12,600*l.* to poor relief. This appropriated revenue has risen to its present large amount from 90,440*l.* in 1881-82, and in 1882-83 was only 85,634*l.* The general revenue for 1895-96, if the appropriated or local taxation is deducted, was 646,103*l.*, and of this no less than 499,511*l.* was from customs and excise. * * * * * *

493. The number of holdings of land in the Island is 92,979, of which 81,924 are under 10 acres each. In 1882 there were only 52,608 holdings, of which 43,707 were under 10 acres each.

Even allowing for the fact that some persons may hold two or more plots of land, it is clear that the island already contains a very large and increasing number of peasant proprietors.

494. The Crown Land Regulations offer facilities for the settlement of the labouring population on the land, and as sugar estates are abandoned some of them will probably fall into the hands of small cultivators.

495. Under the agreement made with the Jamaica Railway Company land was to be made over to the company on the scale of one square mile of land for each mile of railway extension. From the report of the Surveyor-General of Jamaica it appears that 70,356 acres have already been actually selected and conveyed to the West India Improvement Company, and 6,444 acres which will shortly fall into the hands of the Government will also be conveyed to them. No use appears to have been made of this land so far, and the Government has intimated to the company the risk which they incur by allowing squatters to settle upon their properties, as 12 years' undisturbed possession will give them a valid title. It is to be hoped that these lands of the company may soon be made available for purchase and settlement.

496. Some of the evidence which we received does not give a very satisfactory account of the general condition of many of the people, and there was a tendency on the part of some witnesses to dwell a good deal on the depressed state of the Jamaica peasantry, but there is little doubt that the bulk of them are in a position which compares not unfavourably with that of the peasantry of most countries in the world, and the facts stated in the following paragraph show that the condition of the labouring classes can hardly have deteriorated.

497. In the last 10 years the number of savings bank accounts of the amount of 5*l.* and under has nearly doubled. The census returns of 1891 show that in the ten years, 1881 to 1891, there had been an increase of 30 per cent. in the number of persons able to read and write. The acreage of provision grounds has increased more than 30 per cent. in ten years. There are 70,000 holdings of less than 5 acres. The area in coffee, usually in small lots, increased in ten years from 17,000 to 23,000 acres. More than 6,000 small sugar mills are owned by the peasantry. The number of enrolled scholars was 100,400 in 1896, as against 49,000 in 1881, while the actual average daily attendance at schools had increased from 26,600 to 59,600. These facts indicate considerable advance, though no doubt in certain districts the people are poor. Distress was, perhaps, more apparent at the time of our visit than is usually the case, for there was a severe drought, the logwood industry, which had been flourishing, had fallen off, and employment on railway works had ceased.

498. On the whole there appears to us no ground for despondency as to the future of Jamaica, either in view of the possible failure of the sugar industry or on general considerations, but it is most desirable that the settlement of the people on the land should be encouraged. * * * * * *

501. The results, in any case, of a falling off in sugar production will not be so serious as in other West Indian Colonies, and

we ascertained by personal observation and inquiry that in two large parishes at least, where sugar cane cultivation has ceased nd bananas have been substituted, a larger population is now maintained than existed in former days, nor was there any reason to suppose that there was any special poverty in those parishes.

502. It does not follow that all abandoned sugar estates could be made to produce bananas, but we received evidence that some such estates were capable of producing abundant crops of bananas, and that in some cases portions of coffee estates which had been abandoned owing to the supposed exhaustion of the soil could, under certain conditions, which are referred to by Dr. Morris, be again brought under the same cultivation.

503. The new United States tariff places a considerable tax on the import of oranges, which will probably affect the export of this fruit from Jamaica, the value of which in 1895–96, owing to the failure of the crop in Florida, was 169,794*l*., though in previous years the value was generally less than one-fourth of this amount.

504. The report of Dr. Morris shows sufficiently how the trade of Jamaica has altered in the last fifteen years, and how far other products have made up for the falling off in sugar, and it is manifest that if the new industries increase, as may be expected, and if the sugar industry can be carried on at a profit the Island will be in a fairly prosperous condition, although it must be always subject, like other countries which depend solely on agriculture, to depression in prices, with the addition of the drawback of droughts and floods as is usual in tropical countries. * * * * * *

506. The Botanical Department of the Island is fully described by Dr. Morris. It has done excellent service in the development of various industries, and has no doubt helped the sugar industry also by attention to the best methods of cultivation, and by endeavouring to improve the canes. It has also imparted knowledge of cultivation to the peasantry. These efforts should be continued, and there seems no reason to alter the constitution of the department or its relation to the local government, but a competent agricultural chemist is required, to be constantly employed in conjunction with the Botanical Department in analysing the soil and its products.

507. There is evidence that good results have arisen from the action of the Jamaica Institute and of the two agricultural associations that exist in the Colony.

508. Before we conclude our remarks on Jamaica some reference must be made to the system of coolie immigration in the Island. By the last return received there were 14,128 East Indian immigrants in Jamaica, of whom 3,762 were still serving under indenture. 27,096 have been introduced since immigration began in 1845, and 8,809 have returned to India. Under the present system the whole cost of recruiting of Indian immigrants and of their passages to and from India is paid by those who employ them, the Government bearing the cost of the supervising and medical establishment in the Island.

509. Formerly and until quite recently the immigrants were imported almost exclusively for the sugar planters, though a small

proportion were assigned to coffee estates. Of late, however, they have been allotted to work on banana plantations. This may lead to complaints by peasant cultivators of bananas that the coolie is imported to compete with them, but if such complaints arise the Jamaica Legislature, which is elected by the taxpayers, can deal with them, and we do not make any recommendation as to the discontinuance of immigration in Jamaica under the present system, although we look forward to a time when, owing to an improvement in the industrial habits of the negro, there will be no necessity to import labour. We recognise that there is evidence to show that on public works, and even on some estates, the Jamaica negro is an excellent labourer, but there is also evidence that on some estates, though not on all, it is difficult to carry on cultivation without a proportion of indentured coolies, whose services can always be depended on. We therefore think it will be wise to abstain from advocating any change at present in the existing system, under which, as the planter pays heavily for introducing coolie labour, he has a strong inducement not to apply for coolies, unless he thinks they are absolutely essential to the working of his estate.

Part III.

CONCLUDING OBSERVATIONS AND SUMMARY.

i.—OBLIGATIONS OF THE MOTHER COUNTRY.

510. In Parts I. and II. of our Report we have expressed the opinion that the sugar industry in the West Indies is in danger of practical extinction ; that no industry or series of industries can in the space of a few years supply its place ; and that some of the Colonies will for a time be unable to meet the necessary and unavoidable cost of administration, including payments on account of the public debt. We have also recommended the adoption of measures having for their object the substitution of other industries for the cultivation of the sugar-cane, and the general amelioration of the economic condition of the people, as well as the relief of the distress which may arise in many places.

511. The carrying out of our recommendations must involve the expenditure yearly of a considerable sum of money which the Colonies will, in their altered condition, be unable to provide. The more depressed the condition of any Colony may be the greater will be its need for additional funds and the less will be its ability to raise them from its own resources, and we consider that in one form or another pecuniary sacrifices by the mother country on behalf of the West Indian Colonies are inevitable.

512. Justification for this view can no doubt be found in the nature of the relations which exist between a mother country and such dependencies as Your Majesty's West Indian possessions. But in this instance we desire to draw attention to peculiar circumstances, which, in our opinion, impose a special and an unusually strong obligation upon the Home Government.

513. The black population of these Colonies was originally placed in them by force as slaves; the race was kept up and increased under artificial conditions maintained by the authority of the British Government. What the people were at the time of emancipation, and their very presence in the Colonies at all, were owing to British action, or to the action of other European nations for the results of whose policy the United Kingdom assumed responsibility on taking possession of the territories in question; we could not, by the single act of freeing them, divest ourselves of responsibility for their future, which must necessarily be the outcome of the past and of the present. For generations the great mass of the population must remain dependent upon British influence for good government, and generally for the maintenance of the progress that they have made hitherto. We cannot abandon them, and if economic conditions become such that private enterprise and the profits of trade and cultivation cease to attract white men to the Colonies, or to keep them there, this may render it more difficult for the British Government to discharge its obligations, but will not in any way diminish the force of them. We have placed the labouring population where it is, and created for it the conditions, moral and material, under which it exists, and we cannot divest ourselves of responsibility for its future.

514. There is also another consideration, which in our opinion ought not to be overlooked. The distress which is beginning to be felt by the population; the difficulty in which some of them are already, or may soon be, placed of finding a livelihood: the still more certain difficulty of providing for their government and education, will be due to the failure of the sugar industry, which is in turn partly due to the protective policy of other countries and to the bounties which some of them grant on the production or export of sugar. To some extent at any rate these bounties and this policy have made sugar cheaper outside the countries in question, a result by which the British consumer has gained very largely. Whilst, therefore, it is unfair to say that the cause of the depression in the West Indies is due to any act of the British Government, we cannot overlook the fact that the British people have been reaping great benefit from precisely that set of circumstances which has been a factor in bringing the West Indies to the verge of serious disaster.

515. In our opinion, this makes it impossible for Your Majesty's Government to take a narrow view of the question, and, if the British people not only have gained, but continue to gain probably more than two millions sterling yearly from the cheapening of sugar by bounties, this fact is a strong reason why they should be generous in discharging the obligations of the mother country to those dependencies which suffer so severely from the operation of the bounty system.

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ii.—THE UNITED STATES MARKET.

516. Some witnesses complained that in their opinion the Colonies had been hampered in making advantageous commercial arrangements with the United States.

517. Notwithstanding the failure of negotiations with the United States in 1884–85, we are not convinced that the Colonies have hitherto lost valuable opportunities of this kind, or have been debarred from obtaining benefits which would have been lasting.

518. As a matter of fact, on the most recent occasion when it was possible to make special terms with the United States, the West Indian Colonies were able to take measures owing to which their sugar was admitted free of duty.

519. The benefits, however, of this arrangement were not so great as was expected, and the agreement did not last, but was put an end to by a change of policy in the United States. The same disappointment and the same fate might have befallen any special arrangement for reciprocity.

520. Hawaii is the only country which has been able to make a special treaty of reciprocity with the United States which has lasted; but Hawaii, owing to various causes, especially to the large investments of American capital in its sugar industry and to the general development of American policy with regard to it, affords no analogy to the West Indies.

521. It does not, however, follow because there has been no substance in this grievance in the past that there may not arise hardship in the future. It is impossible to foresee what offers or demands may be made by the United States, or what opportunities may arise.

522. The question of special reciprocal tariff arrangements has been re-opened by the provision made in the Revenue Law of the United States by which the President is empowered to enter into commercial treaties with countries willing to give advantages to the trade of the United States, and in return for such advantages to grant a reduction by 20 per cent. of the duties imposed by the Act.

523. The United States is the nearest and therefore, in one sense, the natural market for West Indian produce. It may be that in time the United States, either by the development of their own beet industry or in other ways, will succeed in supplying their own market and so cease to take or to need West Indian sugar. But at present this is not so; and perhaps may not be so for a long time. In the meantime, therefore, the British Government should take care that if the West Indies lose the market of the United States, it shall not be owing to provisions in Imperial treaties, which could be removed without involving a loss to the Empire which would be altogether out of proportion to the gain that would accrue to the West Indies.

524. It would be very unfortunate if, at a time when conditions in the British market were, from special causes, exceptionally unfavourable to West Indian sugar, these colonies were to be excluded from actual or possible markets elsewhere; and a serious political difficulty would arise if at such a time the exclusion were to be the direct consequence of the Imperial connexion. For such a hardship incurred under such conditions the Colonies would no doubt put forward a strong claim for special treatment by the mother country, and one which it might be difficult to resist.

iii.—DANGER OF DEPENDING ON A SINGLE INDUSTRY.

525. The recommendations involving expenditure by the mother country, which we have considered it our duty to make, are based primarily on the present and prospective depression of the sugar industry in the West Indies, but they are of such a nature that they should, in our opinion, be carried out even if the sugar industry were restored, temporarily, to a condition of prosperity.

526. It is never satisfactory for any country to be entirely dependent upon one industry. Such a position is, from the very nature of the case, more or less precarious, and must in the case of the West Indies result in a preponderating influence in one direction tending to restrict development in other ways.

527. The representatives of the sugar industry in the West Indies have had special means of influencing the Governments of the different Colonies, and of putting pressure on the home Government to secure attention to their views and wishes. Their interests have been to a very great extent limited to the sugar industry, and they have seldom turned their attention to any other cultivation except when the sugar industry ceased to be profitable. The settlement of the labouring population on the land, and the encouragement of the products and forms of cultivation suitable for a class of peasant proprietors formed no part of their policy; such measures were generally believed to be opposed to their interests, which they regarded, no doubt, as identical with the best interests of the community, and in, at least, some of the Colonies met with opposition at their hands. If a different policy had found favour, the condition of the West Indies might have been much less serious than it is at present in view of the probable failure of the sugar industry.

528. The general statement regarding the danger of depending on a single industry applies with very special force to the dependence of the West Indian Colonies upon the sugar industry, for the cultivation of sugar collects together a larger number of people upon the land than can be employed or supported in the same area by any other form of cultivation. In addition to this it also unfits the people, or at any rate gives them no training, for the management or cultivation of the soil for any other purpose than that of growing sugar cane. The failure, therefore, of a sugar estate not only leaves destitute a larger number of labourers than can be supported upon the land in other ways, but leaves them also without either the knowledge, skill, or habits requisite for making a good use of the land. In those Colonies where the sugar industry cannot be carried on without imported coolie labour the position of dependence upon this one industry is still more dangerous. In these cases not only is there a yearly charge upon the public revenue to meet the cost of immigration, but a liability for back passages is incurred, which a failure of the industry would leave the Colony without funds to meet.

529. Whilst, therefore, the vital importance of the sugar industry to the present prosperity of nearly all the Colonies is beyond dispute, we wish to observe that so long as they remain dependent

upon sugar their position can never be sound or secure. It has become a commonplace of criticism to remark upon the perpetual recurrence of crises in the West Indian Colonies, and we submit that the repeated occurrence of such crises, as well as the fact that the present crisis is more ominous than any of the previous ones, illustrates the danger to which we have referred, and adds much force to our recommendations for the adoption of special measures to facilitate the introduction of other industries.

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iv.—THE COST OF RELIEF.

530. We have no doubt that if there is so complete a failure of the sugar industry as now appears probable, some of Your Majesty's Colonies in the West Indies will be unable for a time to meet the cost of public administration as well as to raise the necessary funds for the relief of distress, and, in some cases at least, for meeting engagements with the East Indian immigrants. In the Colonies which depend entirely or almost entirely upon sugar there is no likelihood of alternative industries being established in sufficient time to provide employment for the people and to prevent the revenue from falling off. In such islands as Barbados, St. Kitts, and Antigua, it is extremely improbable that any new industries that can be established will ever completely take the place of sugar, or enable an equally numerous population to maintain themselves in the same degree of comfort. The revenue may be permanently lower than it is at present, and the administration must be carried on in a more economical manner, and, probably, with some loss of efficiency.

531. The islands which are in the best position are Grenada, Jamaica, and Trinidad, and we do not anticipate that either of the two latter will require special assistance from the Home Government. The amount of assistance which the other Colonies and islands may require we find ourselves unable to estimate. It must depend very largely on the extent to which and the rapidity with which the sugar industry may succumb. We have, however, no hesitation in recommending that the Home Government should undertake to meet for a period of ten years the cost of the Botanic Department and Botanic Stations which we have proposed should be established, and in this assistance which is given to its immediate neighbours, Grenada, though somewhat better off, should share.

532. The total cost may be placed at 9,700*l.* yearly for Tobago, Grenada, St. Vincent, Barbados, St. Lucia, Dominica, Montserrat, Antigua, and St. Kitts-Nevis. This department should be administered by an Imperial officer, who would also act as consulting officer to the Colonies of Jamaica, Trinidad, and British Guiana, when they wished to obtain the benefit of his advice. The nine islands which we have named already maintain Botanic Stations at their own cost, with the exception of Tobago. We recommend that they be relieved of the charge they now bear on this account, which amounts to about 3,200*l.* a year. This arrangement will not, in the long run, throw any additional burden on the Home Government, as we feel sure that the islands in question will

require assistance for general purposes, and if they are relieved of the cost of the botanic stations this assistance will be proportionately reduced. If the Governments of the various Colonies contributed to the cost of the Botanic Establishment a system of divided control would be established, a result which, in the interests of efficient administration, we consider it desirable to avoid. The yearly cost of this officer with his assistant and office, and including provision for the publication of papers on subjects of practical interest, may be taken at 2,700*l.*

533. A grant of 1,000*l.* yearly for experimental cultivation of sugar cane should also be given, and an equal sum to meet the cost of rewards to successful cultivators and to assist elementary schools in teaching agriculture.

534. We also think it desirable that where higher schools exist some arrangement should be made for the teaching of scientific agriculture. The yearly cost would probably be 2,600*l.*

535. We think that the cost of the subsidies to the steamers which will provide frequent and regular communication between certain islands as well as the cost of fruit steamers between St. Vincent, Dominica, and New York, should be borne by the Home Government. There is practically no other means of providing the necessary funds. These subsidies should not exceed 10,000*l.* yearly.

536. The total annual cost to the Home Government of our recommendations in connexion with the Botanic Department, scientific agricultural education, and subsidies to steamers, will therefore amount to 27,000*l.*

537. We think it out of the question that Your Majesty's West Indian possessions should, under any circumstances, be allowed to remain a perpetual burden on the taxpayers of the United Kingdom, and the steamer subsidies might be granted in the first place for five years, on the understanding that at the expiration of that term the necessity for their continuance on the same or a reduced scale for a further period of five years will be subject to reconsideration.

538. The assistance for the Botanic Department and agricultural education should be granted for ten years.

539. It should be clearly laid down that after the expiration of ten years Your Majesty's Government will have an absolutely free hand as regards reducing or abolishing altogether the amount of assistance of whatever kind to be granted yearly.

540. In the case of Barbados we have already recommended that money should be lent by the Home Government for the purpose of establishing central factories. We do not think that a larger sum than 120,000*l.* would be required for this purpose in the first instance, and we trust that the loan will not, in the long run, impose any burden on the Imperial Exchequer. If, however, the factories failed to work at a profit, the loss must ultimately fall on the mother country, as neither the estates nor the Colony could in such a contingency find the money. On the other hand if the scheme succeeded, it might be extended in Barbados, and possibly in other islands also.

541. We propose that the assistance which we have already recommended should be given unconditionally. But it is more

than probable that further assistance will be required by some of the Colonies, and we do not propose that such assistance, if given, should be unconditional. St. Vincent, Antigua, St. Kitts-Nevis, Dominica, Montserrat, Barbados, British Guiana, and, possibly, St. Lucia and Trinidad, may all require assistance for one or more of the following purposes:—To enable them to avoid bankruptcy, or to relieve distress, or to deal with the East Indian immigrants, or to make roads, or to settle the labouring population on the land, or to promote emigration. If a Colony should require assistance of this nature it should be made a condition of any grant by the Home Government that all practicable economies shall be enforced and the resources of the Colony employed to the fullest extent before assistance is applied for, and also, that if such assistance is granted, the Colonial Government shall consent to such modifications of its political constitution as Your Majesty's Government may consider to be necessary in order to ensure economy and efficient administration.

542. We shall not attempt to make a complete estimate of the amount of assistance which these Colonies may require as it depends altogether on the extent to which the sugar industry fails, the rapidity with which it fails, and the rate of progress in substituting other industries. It is, however, certain that a considerable amount of assistance will be required in any case, and of this amount we are able to make an estimate.

543. The Islands of St. Lucia, St. Vincent, Montserrat, Antigua, and St. Kitts-Nevis have floating debts which represent accumulated deficits, the money having been raised on short-term debentures. The most economical course will be to clear these debts off at once, by a grant from the Imperial Exchequer, and we think that similar assistance should be given to Tobago. These islands at present pay interest at the rate of 4 per cent. on their floating debt, and it will be cheaper to pay off the debt for them than to supply them with money to pay interest charged, and repay instalments of the principal. The amount of the grant required may be taken at 60,000*l*.

544. In St. Lucia, St. Vincent, Antigua, St. Kitts-Nevis, Dominica, and Montserrat the revenue does not equal the expenditure at present, and we think it likely that grants amounting in the aggregate to 20,000*l*. a year may be required for some time.

545. The Government of St. Vincent will require a grant to enable it to take possession of some of the existing sugar estates and to allot them to negro cultivators, and Dominica should receive a grant to enable it to open up communication with some portion of the most fertile and most accessible lands which are at present uncultivated; any further extension of roads in Dominica, which are much needed, should be carried out gradually, as the resources of the Island will permit. The special grants to St. Vincent and Dominica may amount to 30,000*l*. Both St. Vincent and Dominica may require to incur some expenditure to enable them to start banana cultivation, though we are not without hopes that this may be done by unassisted private enterprise when it is known that steamers will be ready to carry the fruit to New York.

546. Barbados and British Guiana have larger populations and are no doubt wealthier Colonies, but their prosperity so greatly depends upon sugar-cane cultivation at the present time that any serious reduction of that industry might throw a very heavy burden on the mother country. We are not in a position to estimate the amount or to say what the expenditure in British Guiana in connexion with the immigrants might amount to. In Antigua it is almost certain that expenditure must be incurred in the relief of distress, and in that island as well as in Barbados and St. Kitts the question of assisting emigration may become one of great urgency.

547. The question of emigration is extremely difficult to deal with at the present time. The failure of the sugar-cane will reduce the demand for labour in all the islands at the very time when emigration from some of them will assume special importance, nor is it easy to see to what countries outside the limits of the West Indies emigration could be successfully directed. The pressure of events will stimulate the tendency to emigrate, and the subsidised steamers will facilitate it by affording a cheap and regular means of communication between the different islands, but the actual operations for assisting emigration must be left to be dealt with by the Governments concerned according to circumstances, and as suitable openings for emigration disclose themselves. In Trinidad and British Guiana there are large quantities of land available for settlement, but under the circumstances that now exist the progress of emigration is not likely to be so rapid as to provide for the large section of the West Indian population that will be unable to find a living near their homes, while the process of emigration will involve much hardship and be attended with many difficulties.

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v.—SUMMARY OF CONCLUSIONS.

548. Finally, we beg leave to submit the following summary of our conclusions :—

a. The sugar industry in the West Indies is in danger of great reduction, which in some colonies may be equivalent or almost equivalent to extinction.

b. The depression of the industry is due to the competition of other sugar producing countries and in a special degree to the competition of beet sugar produced under a system of bounties. It is also affected by high protective tariffs, and by the competition of cane sugar, the production of which is specially encouraged by the Governments concerned. The causes of the depression may be described as permanent, inasmuch as they are largely due to the policy of foreign countries, and there is no indication that that policy is likely to be abandoned in the immediate future.

c. It is not due in any considerable degree to extravagance in management, to imperfection in the process of manufacture, or to inadequate supervision consequent on absentee ownership, and the removal of these causes, wherever they exist, would not enable it, generally, to be profitably carried on

under present conditions of competition. In many places in the West Indies, sugar is not manufactured according to the best and latest processes, but even the estates which have introduced the best machinery suffer from the depression, and we have little doubt that the latest machinery would be much more generally employed but for the general and apparently well founded conviction that even with the assistance of such machinery the business could not be profitably carried on. In places where large factories equipped with the best machinery cannot be established owing to local causes it is doubtful if the sugar industry could, under any circumstances, be restored to a condition of permanent prosperity, except, possibly, in localities which enjoy very special advantages in soil, climate, and labour supply.

d. The depression in the industry is causing sugar estates to be abandoned, and will cause more estates to be abandoned, and such abandonment is causing and will cause distress among the labouring population, including a large number of East Indian immigrants, and will seriously affect, for a considerable time, the general prosperity of the sugar-producing Colonies, and will render it impossible for some, and perhaps the greater number of them, to provide, without external aid, for their own government and administration.

e. If the production of sugar is discontinued or very largely reduced, there is no industry or industries that could completely replace it in such islands as Barbados, Antigua, and St. Kitts, and be profitably carried on and supply employment for the labouring population. In Jamaica, in Trinidad, in British Guiana, in St. Lucia, in St. Vincent, and to some extent in Montserrat and Nevis, the sugar industry may in time be replaced by other industries, but only after the lapse of a considerable period and at the cost of much displacement of labour and consequent suffering. In Dominica the sugar industry is not at the present day of great importance. We think it right to add that in all Colonies where sugar can be completely, or very largely, replaced by other industries, the Colonies in question will be in a much sounder position, both politically and economically, when they have ceased to depend wholly, or to a very great extent, upon the continued prosperity of a single industry.

f. The total or partial extinction of the sugar industry would, in most places, very seriously affect the condition of the labouring classes for the worse, and would largely reduce the revenue of the Colonies. In some places the loss of revenue could be met to a limited extent by economies, but this could not be done universally nor in a material degree in most of the Colonies. Some of the Colonies could not provide the necessary cost of administration, including the relief of distressed and necessitous persons, or of the support and repatriation (when necessary) of the East Indian immigrants, without subventions from the mother country.

Jamaica, Trinidad, and Grenada may be expected to meet from their own resources the whole of the expenditure that is likely to fall on them.

g. The best immediate remedy for the state of things which we have shown to exist would be the abandonment of the bounty system by continental nations. This change would, in all probability, enable a large portion of the sugar-cane cultivation to be carried on successfully, and would certainly reduce the rate at which it will diminish.

Looking, however, to what appears to be the policy of the United States of America, to the great cheapening of the cost of production of beet sugar, and the fact that many countries appear to have singled out the sugar industry as one which ought to be artificially stimulated in various ways, it is not clear that, even if the bounties were abolished, another crisis of a similar character might not arise in the West Indies at a future day.

h. A remedy which was strongly supported by witnesses interested in the West Indian sugar estates was the imposition of countervailing duties on bounty-fed sugar when imported into the United Kingdom.

The majority of the Commission have been unable to support this course. The Chairman is of a different opinion, and has stated his views separately on this point.

i. The special remedies or measures of relief which we unanimously recommend are—

(1.) The settlement of the labouring population on small plots of land as peasant proprietors.

(2.) The establishment of minor agricultural industries, and the improvement of the system of cultivation, especially in the case of small proprietors.

(3.) The improvement of the means of communication between the different islands.

(4.) The encouragement of a trade in fruit with New York, and, possibly, at a future time, with London.

(5.) The grant of a loan from the Imperial Exchequer for the establishment of central factories in Barbados.

The subject of emigration from the distressed tracts also requires the careful attention of the various Governments, though we do not find ourselves at the present time in a position to make recommendations in detail.

j. We estimate the cost of the special remedies recommended in (2) (3) and (4) of *i.* at 27,000*l* a year for ten years, the expenditure to be borne by the mother country. We estimate the amount of the loan to Barbados for the erection of central factories at 120,000*l* This measure no doubt involves the risk of loss.

Grants will be required in Dominica and St. Vincent for roads, and to enable the settlement of the labouring population on the land to be carried out, and their amount may be taken at 30,000*l*. A further grant of about 60,000*l*. is required to clear off the floating debt in some of the smaller islands.

In addition, the smaller islands should receive grants to enable them to meet their ordinary expenditure of an obligatory nature. The amount may be placed at 20,000*l*. a year for five years, and possibly a reduced amount for a further period of five years.

The expenditure which we are able to estimate may be summarised as follows :—

(1.) A grant of 27,000*l*. a year for ten years.

(2.) A grant of 20,000*l*. a year for five years.

(3.) Immediate grants of 60,000*l*. and 30,000*l*., or 90,000*l*. in all.

(4.) A loan of 120,000*l*. to Barbados for the establishment of central factories.

k. As to the amount of expenditure which it may be necessary to incur in relieving distress (especially in British Guiana and Barbados), in promoting emigration, and in supporting and repatriating East Indian immigrants, we are unable at the present time to form any estimate, but it might be very great, if there occurred a sudden and general failure of the sugar industry in Bardados and British Guiana, where the population is comparatively large, and the people depend so greatly upon the cultivation of the sugar-cane. In such a contingency neither British Guiana nor Barbados would be able to meet the necessary cost of administration for, probably, a considerable number of years.

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vi.—CONCLUDING OBSERVATIONS.

555. We cannot close our report without expressing our strong sympathy with the planters, who have struggled against very adverse circumstances to maintain the sugar industry, and with the very numerous persons who depend directly or indirectly upon that industry, and have severely suffered from its decay. Among the latter we would include not only the labourers, but many of different races and a higher social class, who, as clerks, overseers, artisans, tradesmen, or in professional vocations, have been impoverished by the depression in sugar.

556. Our own task has been of a discouraging nature. Our duty has been to inquire into the condition of a depressed and failing industry, and to consider if any means are possible for restoring and maintaining the prosperity of those Colonies that depend upon it, and, in any case, to suggest the establishment of other industries which might supplement the cultivation of sugar cane, and, in case of need, provide means of subsistence for the people. Our conclusions will, no doubt, disappoint many who have looked for some immediate and substantial relief, but, with the most sincere wish to do all in our power to help the West Indian community, we have not felt ourselves able to make other recommendations than those which we now humbly submit for Your Majesty's gracious consideration.

(Signed) H. W. NORMAN.
E. GREY.
D. BARBOUR.

25th August 1897.

DLXXXV.—MISCELLANEOUS NOTES.

MR. JOHN HENRY HOLLAND, who was appointed Assistant Curator of the Botanic Station at Old Calabar, in the Niger Coast Protectorate (*Kew Bulletin*, 1896, p. 147), has returned to this country after having completed his first term of service. He will spend a part of his leave at Kew in studies connected with the work of his department, and return to West Africa early next year.

MR. WILLIAM SCOTT, F.L.S., Director of Forests and Gardens in Mauritius, died somewhat suddenly in Scotland on the 3rd Oct. Mr. Scott, after a course of training at Kew, was appointed Assistant Director in 1881, and succeeded Mr. Horne as Director in 1893. He had lately arrived in this country on leave after an absence of 16 years in the tropics, and apparently in excellent health. Mr. Scott was a capable officer and thoroughly devoted to his duties. His death will be a great loss to the Colony in which he has so long served. He entered upon the charge of Mauritius Gardens under singularly depressing circumstances, as his first work was to restore the havoc wrought by the hurricane of 1893, which had nearly destroyed one of the most attractive gardens in the East. By dint of great zeal and energy, he had accomplished this work and left his department in excellent order. As he was a comparatively young man, it was hoped that he had a career of great usefulness before him. His untimely death will be received with great regret by all who knew him.

Malpighi Celebration.—The celebrated Italian anatomist and botanist, Marcello Malpighi, was a contemporary of Hooke and Grew, not less illustrious in our own country. He was elected an honorary member of the Royal Society in 1668, and in 1672 the Society published his great work "Anatome Plantarum." On September 8th of the present year a monument to his honour was unveiled at Crevalcore, near Bologna. The Royal Society nominated Dr. Scott, F.R.S., Honorary Keeper of the Jodrell Laboratory, to represent it on the occasion. He was, however, unfortunately prevented by illness at the last moment from travelling to Italy.

Botanical Magazine for October.—*Cirrhopetalum robustum* is a New Guinea species, having yellow-green sepals, yellow and rose petals, and blood-red labellum. The Kew plant was received from Colonel Trevor Clarke, in 1893. *Agave Bouchei*, from Mexico, has been in cultivation at Kew for about twenty years, but it did not produce flowers till 1896; the flower spike was two feet long. *Primula sinensis* was raised from seed, supposed to have been received from Ichang, and a plant was sent to Kew by Mr. Edmund Hyde, of Ealing, in December, 1896. *Calathea rufibarba*, believed to be a native of Brazil, was sent to Kew from the Imperial Botanic Gardens, St. Petersburg. The whole plant, except the golden-yellow flowers, is clothed with long brown hairs. Particular interest attaches to *Pterisanthes polita*, a

member of the Vine family, which has one branch of the bifid tendrils curiously flattened and bearing embedded male and stalked marginal female flowers. It is native of the Malayan Peninsula and Islands. The Kew plants were received from the Botanical Gardens at Singapore.

Hop Hornbeam.—*Ostrya carpinifolia*, Scop. The death and consequent removal of probably the finest specimen of this tree in Britain, although a grafted one, has unfortunately to be recorded. It stood near the Hardy Fernery on lawn L ($\frac{E}{7}$) of the Kew Key-Plan. For several years it had not been in good health, and on being taken down, its roots were found to have been killed by fungus mycelium. A portrait of the tree appeared in the *Gardeners' Chronicle* for September 30th, 1890, p. 275; another is given by Loudon in his *Arboretum et Fruticetum Britannicum* in 1838. The species, which is a native of South Europe, Asia Minor, &c., was introduced to this country prior to 1724, as it is mentioned in Furber's *Nursery Catalogue*, published in that year. The actual measurements of the Kew tree were as follows: height, 59 ft.; spread of branches, 68 ft.; girth of trunk 3 ft. from the ground, 9 ft. 4 in. Fruit was abundantly produced, but no perfect seeds were ever developed.

Tropical Fern House.—The reconstruction of No. II. which holds the collection of Tropical Ferns, was completed during the past summer. The history of the house is given in the *Kew Bulletin* for 1895 (pp. 200, 201). The east wing was reconstructed in 1889 on the mixed system of iron and wood construction described in the same volume (p. 300). The west wing and transept have now also been reconstructed on this principle. The ridge of the transept which formerly did not extend beyond the main body of the building, has been continued across it with a great improvement of both internal and external effect. The use of green glass has now been altogether abandoned.

Nepenthes House.—During the past year a house has been erected for the cultivation and exhibition to the public of the fine collection of Pitcher plants possessed by the Royal Gardens. They require peculiar treatment for their successful growth, and this cannot be given in a house devoted to a mixed collection of stove plants and always open to visitors. Hitherto the greater part of the collection could only be grown in houses not accessible to the public, and when exhibited was not shown to advantage.

The new Nepenthes House at Kew is a light span-roofed structure built alongside the stove (No. IX.) in the T. range. It is 70 ft. long, 12 ft. wide, and 9½ ft. high; the path is central, and consists of an iron grating over several rows of hot-water pipes that are deeply placed so that they may be partially covered with water if necessary. Abundance of moist heat is thus provided, so that the plants have some of the conditions they enjoy in nature provided for them. The new house has no external doors; visitors enter and leave it by doors opening from the

stove, while employés can enter through a new and light potting shed at one end. At present there are about a hundred specimens of species and hybrids of Nepenthes in the new house, grown in teak baskets, and suspended from the roof. The house was opened to the public October 15th.

The following is a list of the species and hybrids cultivated at Kew :—

SPECIES.

Nepenthes albomarginata, *Lobb*, Singapore.
ampullaria, *Jack*, Malaya.
bicalcarata, *Hook. f.* Borneo.
Burkei, *Mast.* Borneo.
— var. excellens.
cincta, *Mast.* Borneo.
Curtisii, *Mast.* Borneo.
— var. superba.
distillatoria, *L.* Ceylon.
gracilis, *Korth.* Borneo.
hirsuta, *Hook. f.* Borneo.
kennedyana, *F. Muell.* Australia.
laevis, *Lindl.* Malaya.
northiana. *Hook. f.* Borneo.
obrieniana, *Lind. & Rod.* Borneo.
Pervillei, *Blume*, Seychelles.
Phyllamphora, *Willd.* Cochin China.
rafflesiana, *Jack*, India.
— var. elongata.
— var. hookeriana.
sanguinea, *Lindl.* Malaya.
stenophylla, *Mast.* Borneo.
Veitchii, *Hook. f.* Borneo.

HYBRIDS.

Nepenthes amesiana (rafflesiana x hookeriana).
atrosanguinea (hirsuta x Sedeni).
Chelsoni (Dominii x hookeriana).
coccinea (hookeriana x Phyllamphora).
cylindrica (Veitchii x hirsuta).
dicksoniana (rafflesiana x Veitchii).
Dominii (rafflesiana x unnamed sp.).
edinensis (rafflesiana x Chelsoni).
formosa (Chelsoni x distillatoria).
henryana (hookeriana x Sedeni).
Hookerae (rafflesiana x Phyllamphora).
intermedia (rafflesiana x unnamed sp.).
mastersiana (sanguinea x distillatoria).
— var. purpurea.
mixta (Curtisii x northiana).
Morganae (hookeriana x Phyllamphora).
ratcliffiana (Phyllamphora x hookeriana).
rufescens (hirsuta x Courtii).
Stewartii (Phyllamphora x hookeriana).
Sedeni (distillatoria x unnamed sp.)
— var. rubra.

HYBRIDS—(continued.)

Nepenthes superba (hookeriana x Sedeni).
Wittei (Curtisii x unnamed sp.).
wrigleyana (Phyllamphora x hookeriana).
Williamsii (Sedeni x hookeriana).

Durian in the West Indies.—The well-known Durian tree of the Indian Archipelago (*Durio Zibethinus*, *L.*) has been successfully introduced to the Botanic Gardens in the West Indies, but hitherto it has not fruited anywhere except at Dominica. In 1895 and again this year fruits have been produced by a tree growing in the garden of Dr. H. A. Alford Nicholls, C.M.G., at St. Aroment. This was originally received from Kew with numerous other plants sent out to the late Dr. Imray and to Dr. Nicholls, in exchange for Dominica plants, contributed at the private expense of the two gentlemen above mentioned. Reference is made to the St. Aroment Garden in the *Kew Bulletin* for 1887, June, pp. 9–10; and a list of the economic plants already established there was given in the *Bulletin* for July of the same year, pp. 10–12. It is gratifying to find that all the seeds saved from the Durian fruits so far produced have been placed by Dr. Nicholls at the disposal of the Botanic Station at Dominica, in order that plants may be raised for distribution to other parts of the Western tropics. One fruit was lately received at Kew, but, unfortunately, it did not arrive in good condition. Those interested in the subject may see a fine plant of Durian, about 15 feet high, in the Palm House, where it has been established for about 15 years, but so far has not flowered.

Lily culture in Natal.—*Lilium longiflorum*, var. *Harrisii*, popularly known as the Bermuda Lily, has for some years been grown on a large scale in Bermuda for the supply of the United States and Europe, the annual export of bulbs being of the value of about £20,000. The bulbs arrive in England in September, when they are planted in pots and kept in frames or greenhouses till they flower in April or May. Efforts appear to have been made to cultivate this lily in Natal for the European market, as is shown by the following advertisement, which appeared in the *Gardeners' Chronicle* for April 17th, 1897:—

"Messrs. Protheroe & Morris will sell by auction at their Central Sale Rooms, on April 21st, a first experimental consignment of 4,000 *Lilium Harrisii*, grown for some years in Natal, where the habit of plant and size of flower have attained great perfection, in addition to the season of flowering being entirely changed. The sender anticipates that by being kept back, or by being potted and allowed to come slowly, flowers of this grand lily may be obtained when nothing like them is in the market."

These bulbs were equal in size and quality to those received from Bermuda; they realised about 15/- per hundred. About 200 were purchased for Kew. These were planted in pots and placed in the open air, where they grew to about a yard in height and flowered freely in September, three months after the Bermuda bulbs.

ROYAL GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 132.] DECEMBER. [1897.

DLXXXVI.—A BUDGET FROM YUNNAN.

The following extracts from a series of letters addressed to Kew by Dr. Henry during last year give an interesting picture of the fascinating flora of Yunnan. Till within the last few years its botanical wealth had not been suspected. Dr. Henry's scientific work has only been accomplished in the intervals of engrossing official duties. It is difficult to conceive what results might not be obtained by a systematic scientific exploration of the country.

From the point of view of geographical distribution, the most interesting fact is the southern extension of vegetation of the Himalayan type. This is fused with a Chinese element purely endemic.

A former letter was printed in the *Kew Bulletin* for 1897 (pp. 99–101).

"Dr. A. HENRY to ROYAL GARDENS, KEW.

"Customs, Mengtse, par Laokai, Tongking,
"February 23, 1897.

"DEAR MR. THISELTON DYER,

"I have just returned from an exceedingly interesting trip to the country south of the Red River, in a district ruled over by an hereditary chief, who treated me with great kindness.

"I reached the great range separating the Red River and Black River basins, densely wooded with large trees (20 feet in circumference) to near the summit, where they are replaced by thick bamboo jungle, so that the range, which is very long, is only crossable by passes at different points. The altitude is 8,000 to 10,000 feet. At this, the dead point of the year as regards vegetable life, there was not much out in flower, but I secured a magnificent *Rhododendron*, a *Magnolia* (both great trees), three Camellias, *Stuartia*, &c. There was a *Daphne* (*indica?*), a shrub with deliciously scented white flowers, a *Primula* at the summit, *Ainsliaea*, two or three species of *Clematis*, &c. Two or three *Araliaceae*, shrubs and trees, occur also up to the summit.

"A very common tree was Oliver's *Tetracentron sinense*, an enormous tree, but with the wood little esteemed. Its fruit spikes were scattered everywhere, and its minute seeds had flown away.

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"I spent two days on the Red River, where the vegetation is tropical; the banana, tomato, *Carica* and Tamarind occurring everywhere in the wild state. The bizarreness of some of the fruits here was very striking. One tree (*Dolichandrone Caudafelina*) has long pods (2 to 3 feet) with a dense covering of thick brown hair, exactly like the tail of an animal.

"On the plateau (7,000 — 6,000 feet) between here and the Red River I found a curious *Primula*, with radical leaves besetting its base like an onion; it successfully resists the grass fires which here are universal, and flowers indifferently level with the ground or on a peduncle 6 to 8 inches high.

"Immense evegreen oaks occurred in the mountain forest.

"The most interesting part of the trip was the aborigines. In the State, 20 miles by 20 miles, ruled over by the chief, not including Chinese settlers, I met with seven distinct races, *i.e.*, distinct physiognomy, speaking mutually unintelligible languages, living apart, never intermarrying, and with different customs and dress.

"Their languages, of which I collected short vocabularies, fall into three divisions, Shan, Miao-tze and Lolo, all of the Chinese type, monosyllabic, non-inflectional. I found the Lolo writing to be in daily use. It is apparently derived from ancient Chinese, say 2,000 years ago, and I have little doubt is the remnant of a highly civilised State. If my information is to be trusted, books of great interest will be found still existing in MS. in this language.

"Great red deer, bears large and small, occur in the mountain forests, the smaller bears leaving scratch marks on the trees, in which they build nests to sleep in.

"I have laid, I hope, the seeds of a friendship with the chief, and hope to gain much thereby, *i.e.*, an intimacy with the aborigines, which is a difficult matter indeed.

"April 30, 1897.—My own collection has already attained gigantic proportions. I have numbered and labelled 660 distinct species, without making a perceptible gap in the immense pile of bundles of dried plants. I almost anticipate 3,000 species in this year's collection, *i.e.*, the year finishing on 1st July. My muleteer is doing good work, being constantly on the road; and I myself am doing everything within a radius of 15 miles round Mengtse, which includes mountains to 7,000 feet altitude.

"Franchet, I believe, estimates Delavay's species from Western Yunnan to be 3,000 in number. Both our collections will have at least 5,000 species, and I venture to predict that Yunnan, when thoroughly explored (say in the 20th century) will be found to have 10,000 species of plants (phanerogams and ferns with their allies).

"The Rhododendrons have been very captivating. They vary in size from gigantic trees to the tiniest shrubs. The most striking one is apparently confined to a mountain peak north of here, some 20 miles. It has broadly oval leaves, about 12 inches long by eight inches broad, brown on the under surface, and the flowers are a delicate primrose yellow, quite large and very numerous.

"The spp. of Clematis are about 20 to 25 species; Oaks 15; *Rubus* 15; Primulas 10 (these have been very disappointing in number, and none is conspicuous in any way). The Conifers include *Cunninghamia*, *Cryptomeria*, *Keteleeria*, and three species of *Pinus;* one of these is *P. massoniana;* another is very remarkable for its perfectly white bark and large cones, with big edible seeds, perhaps allied to *P. koraiensis* and *P. Armandi;* the third I have just discovered. It is one solitary big tree planted on the top of a mountain, over four graves. I haven't yet secured cones. It is beautifully pyramidal in shape and with delicate, very green foliage, and a *port* different from any pine I have seen in China.

"Talking of soap-trees, there are two here, *Gleditschia Delavayi*, with its enormous pods, some 20 inches long, and *Pancoria Delavayi*. The latter is an exact imitation of *Sapindus Mukorossi*. Of course it differs technically in flowers and indumentum of the leaves, but no mere non-botanist would dream of putting them in different genera. I will send plenty of fruit of both (and seeds).

The *Leguminosæ* are very numerous; *Desmodium*, *Lespedeza* and *Pueraria* running riot in number of species. I have secured some very northern forms, as a *Fagus*, a *Betula*, &c.

"I am inclined to think that isolation, as in Yunnan by its multitudinous ranges and valleys, must play a great part in the invention of new species, and the study of the flora of this province will, I think, enable some one hereafter to get at important factors in this evolution. One of the most curious so-called species here is *Ehretia corylifolia*; it is a distinct species, but how near it is to the common *Ehretia macrophylla!* if I don't mistake, I think I shall get connecting links. *Pari passu* with the richness of types in the vegetable kingdom is the extraordinary diversity of the genus *Homo*. One is inclined at first to think that all the tribes one hears of must be the same people often under a new name. That is not so; the languages are distinct, and the physical characteristics are often very well marked, too.

"I have two Lolo MSS. and as yet can't get a Lolo to come and explain them. The investigation of this writing will throw, I believe, a new light on Chinese. Of the native languages, three great stocks (Miao-tze, Lolo, Shan) are of the Chinese type, *i.e.*, monosyllabic, tonal, non-inflecting, non-agglutinative. The question of tones is a difficult one. One can scarcely understand any people beginning a language with such an absurdity, say, as the Shan words :—

má to come,
mā a dog,
mâ a horse,

and so on in five or six ways altogether. I have an idea of the origin, which I won't give away just yet. What do you think? Give a guess. Do you suppose such things as tones are original and fundamental, or derived and secondary?

"Malay, which is polysyllabic and non-tonal connects on to the Chinese group by certain peculiarities which don't occur in other groups of languages. The Chinese group (*i.e.*, Chinese, Miao-tze, Lolo, Shan, Annamese, Siamese) display one curious sub-division, in some the adjective follows the noun always, in others (as Chinese) it precedes the noun.

"In addition to my own collection, I have received from Morse, at Lungchow in Kwangsi province, some 400 species. Some are quite interesting. He sends me *Tournefortia sarmentosa*, which is hitherto known only as an Oceanic plant (Formosa, Mauritius, Philippines, Australia), and it is like the very pretty *Osteomeles anthyllidifolia* in this respect. By the way, have you the latter in cultivation? He also sends me *Dolichandrone Cauda-felina*, which I found on the Red River. Its pods are the most comic of fruits; a long tail of some prehistoric animal would be near it. What is the meaning of the projecting hook on fruit of trees, such as *Cæsalpinia Sappan*? Is it because other climbing Cæsalpinias have such a point? It doesn't mean a time when tall beasts like giraffes and so on rambled about and got fruits from big trees stuck in their wool. Of course, there are monkeys running about in the trees. I can't see any possible use, *e.g.*, in hairs of fruit of *Pueraria thunbergiana*, at least any at present. The fruits stick on the climbing shrub till they dehisce, and out drops the seed.

"I forgot to say that I have secured a magnificent *Paulownia* (the flowers are not precocious). Unfortunately I haven't flowers of either of the two described Paulownias (*P. Fortunei* and *P. imperialis*) to compare with it, but it seems to differ from both; it has much smaller capsules than *P. Fortunei*, according to description. It is the most magnificent tree, in some ways, that I have ever seen. Seeds of it will have to be collected later on. It would really take a dozen enthusiastic botanists to cope with the work here.

"The Lilies are only four for so far: *Lilium Brownii* (?), a lily with yellow flowers, numerous; and a small lily with a solitary pink flower, and *L. giganteum*. The Orchids are very numerous. But I could go on indefinitely.

"My photographic camera, which has been four months on the way from Haifong to here, is just about to arrive. Can you give any suggestions concerning the uses of photography in botany? Of course, I suppose pictures of trees like the *Paulownia*, just spoken of, pictures of curious fruits, &c., will be useful. I mean some good scientific line. If you can, please answer the question, and refer me to books or journals, if necessary, for illumination.

"Szemao (the newly opened port west from here) is doing pretty well. I notice in the estimates that £800 is provided as salary for Consul at Momein (Têng Yueh), and I suppose that place will have a Customs also. Then the railway is being pushed on from Mandalay to Kun-lon on the River Salwen, and that will mean another station. Already Wuchow is open on the West river to Canton, or, to put it pictorially, five new places on the five great rivers, five points of entry into Southern China. Lungchow, which is in Kwangsi, and is being connected by rail with Haifong or Hanoi, does no trade practically."

"June 3, 1897.—I find, when I go with my pony into the woods, that the wild animals seem less frightened, so I get good glimpses occasionally of deer, weasels, small black ones and large flying ones, of partridges, pheasants, snakes, etc. But the other day I saw bigger game; I was in a deep ravine, with the pony and dog left behind on the side of the hill above. I heard loud

and angry barking. I clambered up, and through the trees soon discerned a great spot of orange; it loomed so large I thought it must be a tiger. Further up I saw a beautiful leopard taking a quiet look at the pony. Loud I halloed—no sign of the dog; the leopard skulked off over the hill. Sorrowfully I rode off, making much melancholy reflection over poor "Jack," the dog. To my astonishment I found him lying waiting for me near the foot of the hill, in an open space where he could look all around. He had been mauled, but not severely, by claws and teeth, but in some mysterious way had escaped out of the leopard's clutch.

"They talk about the spots of the leopard being protective, but there is no such brilliant object in nature as a leopard on the sunny side of a rocky hill. These beasts are nocturnal in habit, and perhaps his courage was less on that account, and he let the dog go when the latter showed fight. How he did bark, so angrily! Wallace is right about the happiness of animals. After such a terrible encounter, the dog immediately was in excellent spirits, and had quite forgotten his danger. Curiously enough, the pony wasn't a bit frightened either.

"With regard to seeds, I will do what I can, especially later on, when I shall have less plant collecting to do in our immediate neighbourhood. But it is really a difficult matter collecting seeds; one arrives on the ground too late or too early. I tried, *e.g.*, to collect seeds of *Gentiana Serra* and *rhodantha*, common plants, and failed to get a single seed. You may say, why not employ a native. Ah! you don't know the Yunnanese. My muleteer, who collects plants, is the only man I know who could or would do the work, and even he only does about one-tenth of what I could do if I had his time. The others, Chinese and aborigines, are too lazy for seed-collecting. I have secured the first aborigine who would venture into foreign employment: no one had any but Chinese before. He is my groom, and is an experiment.

"The fact is that if one had nothing else to do, one might organize plans and people for carrying on such work; but it is difficult for me, as I have a good deal to do. And yet I doubt if many of my specimens will be collected again for 50 years, as I have put no small amount of energy into parts of the botanizing. The flowers of a certain *Zanthoxylum* have cost me three visits to one spot and an expenditure of six hours time.

"Money is not what is wanted, but time, oceans of time. Nothing astonishes people at home so much as the fact, a real fact, that in countries like China you cannot do everything with money. Patience is more valuable. I can get a good deal of work out of Chinese on a trip, when I am with them, but not otherwise. Chinese are very susceptible to weather, a shower breaks their hearts; they don't like going into jungle, as thorns annoy them and tear their clothes. Now, I don't mind 100 thorns; I wait till I have a lot in, then sit down and pick them out.

"For the Chinese, the root of the matter is an absence of nervous energy. Their industry, so much talked of, is unreal in most parts of the Empire. They are not exactly lazy, but they

don't know how to begin to work, as compared with a European. And as to their ever seriously fighting or competing in the arts of peace or war with the Anglo-Celtic race, it is an idle dream."

"July 19, 1897.—I would suggest, so great is the variety and beauty of the Chinese flora, and so fit are the plants for the European climate, that an effort ought to be made to send out a small expedition, the funds, *e.g.*, being provided by a syndicate of, say, a horticulturist, a private gentleman or two, &c. I estimate £1,000 would cover the expenses for two years; and what I would recommend is that a man be selected who has just finished his botanical studies at Cambridge. I mean, don't send a collector, but a gentleman, a student and an enthusiast. The locality I would suggest is the mountain range separating Szechwan from Shensi, or thereabouts, the expedition starting from Ichang in April and covering two seasons.

"A person like me, with daily official work, can do little or nothing. We live in towns, in the midst of cultivation, and the distances to get to the hunting grounds are enormous, and when we do get there we are half worn out. There is also something uncanny in the way in which herbaceous plants disappear out of view after they have had their gaudy season of flowering, and when the plant is found the seeds are green, or the capsules are empty. Such are some of the difficulties.

"My own plant collecting, since I have been here, is enormous, but at such an expenditure of muscular force! It would be strictly paralleled by that of a bank-clerk in London who made excursions on Sundays all over England, and two or three times a year made hurried trips to the Carpathians and the Pyrenees. The bank-clerk would really in such a way expend less energy.

"I have been reading your account of the Cyclamen, which I find very interesting. In a place like this, where one is overwhelmed with the multitudes of species of plants, one is interested in any speculation concerning the reason why. In a previous letter I spoke of the red clay deposit so common in this province, and hinted at its possible glacial origin, but I don't think now there has been the slightest glaciation here, the clay is simply a wash-out of the universal limestone, and what one finds here is a country which has not been disturbed geologically for an immense period The country is cut up into innumerable valleys and petty plains and isolated peaks; and isolation seems to be the factor which has kept up so many different forms of life, once they were started.

"Another interesting series of questions is to find out what are the uses of the supposed adaptations one sees, *e.g.*, what is the use of the fur like the tail of a cat on the fruit (an enormous fruit) of *Dolichandrone Cauda-felina*, a small tree which occurs in the Red River valley. In this hot steaming valley there are many extraordinary fruits; now-a-days there are scarcely any large animals, except tigers and leopards. But there are multitudes of large and ferocious ants which destroy the foliage of many trees for nest-building purposes.

"I assume that everything of this kind has a meaning, a use, if one could find it out, and people forget the part which enormous

and curious animals in former geological times have played. Take the question of thorns. I think they do serve as protection against animals, and are not, as regards their preservation, when once developed, mere expressions of climate and soil changes.

"I was quite disappointed in the spring flora here. The first half of the year is rainless, and, except in woods with perennial springs and streamlets, the whole country remains almost barren. There is consequently a great variety of plants which can bear long and sustained drought, and the dodges are innumerable. The bulbous covering of scaly leaves in the primrose I mentioned as coming up in the burnt grass hills is, of course, not a dodge against grass-fires, but a dodge against the drought it sustains.

"There is one point in connection with the change in the cultivated *Primula sinensis* which is not, I think, generally known. The wild form occurs in such a different condition of soil from what is adopted in cultivation. In the Yangtze gorges the wild form grows on cliffs in practically earthless ledges, and merely midst the piled-up remains of previous years' leaves, &c. In a word, it occurs in the driest possible situation, and I don't think even in wet weather, in summer, these ledges, when it occurs, really get wet. I am now speaking from memory, but I think I am quite correct as to the habit of the wild plant. The ledges, often hundreds of feet in length, present a beautiful appearance at flowering time in the dry winter season. In connection with this, there is no history to be got of when or how the Chinese began the cultivation of such plants, and it is quite remarkable how few specimens of really wild forms of many cultivated Chinese decorative plants there are, and also curious how many plants called *japonica* are only Japanese in cultivation, and are originally Chinese in origin.

"It is also remarkable that the Chinese shrubs in cultivation are scarcely the ones which make the best show in the wild state. At least, that is my opinion.

"In conclusion, I can see now that there were hundreds of interesting points which I might have noticed earlier in my plant collecting if I had had the experience or the genius or the teaching.

"If you ever again come across a budding collector like what I was when we began correspondence some years ago, please insist on him being more than a mere collector, and perhaps you will help to develop a naturalist.

"August 2, 1897.—I enclose a photograph taken by Mr. Bons d'Anty in the Upper Shan States south of Szemao. He is the French Consul at Szemao, and is collecting some plants for me, the interesting ones of which you will receive later.

"He says: 'The palm is very common; it is seen around every temple, and the leaves are used to make paper with, or rather are used as paper, being cut into long strips. In the photograph one can see the way the leaves are cut off for this purpose.'

"I am in doubt as to what the palm is, but doubtless you will be able to identify it at Kew [probably *Trachycarpus sp.*].

"The palms used as paper are *Borassus* and the Talipot palm, according to Treasury of Botany, but it doesn't seem to me to fit in with descriptions of these.

"I also enclose for the Museum, if you think it is of sufficient interest, a sample of the palm-strips with writing on it, sent me by Mr. Bons d'Anty. The writing is probably Shan, but Mr. Bons doesn't say.

"From a packet of plants sent me by Mr. Bons, collected on a trip south of the Chinese frontier, into the British Shan States, it would seem that the flora changes at once into the Indian type the moment the Yunnan plateau is left, *i.e.*, it loses Chinese looks.

"We are having a wet summer, much more wet than last year, and it is very unpleasant. The plague goes on apace. I tried to go out yesterday to the mountains, but had to return on account of the heavy rains. I stayed some little time at a Lolo village on the plain, and rested under a magnificent mulberry, the finest I have ever seen. It had the enormous spreading-on-the-surface-of-the-ground roots which I think is called Table-kind of root. I went in quest of a Lolo Pundit that I heard of, but we found his house and the compound deserted, as there had been three cases of plague, and the Pundit had fled. I hope to secure his services, but the Lolos are very shy, or rather, I think, are afraid to link themselves with Europeans, as the Chinese suspect them then of ulterior designs. The Lolos were allied as a rule with the Mahomedans in the rebellion of Yunnan, and there is no love lost between them and the Chinese.

"The different status of women amongst the Chinese and the races allied to them is a curious problem. Ancient Chinese poems don't show modern Chinese life at all. However, I must conclude."

"Yours very truly,
(Signed) AUGUSTINE HENRY."

DLXXXVII.—RUBBER AND COFFEE IN LAGOS.

The following extracts taken from the Annual Report for 1895 on the Colony of Lagos, West Africa (*Colonial Reports*, Annual, No. 185, 1896), contain interesting information respecting the progress of the rubber and coffee industries lately developed in that dependency.

The rubber industry was discussed in these pages two years ago (*K.B.* 1895, pp. 241–247 with plate; and 1896, pp. 76–77) while coffee planting in Lagos was the subject of a later article (*K.B.* 1896, pp. 77–79).

RUBBER.

"By far the most important factor is the extraordinary development of the rubber industry, the statistics of which are almost incredible. On the Gold Coast we are told that the export of rubber, which in 1882 was *nil*, had attained in 1893 to the annual value of £200,000. Lagos, in 1894, shipped 5,723 lbs. of rubber to Great Britain, and 144 lbs. to Germany, in all 5,867 lbs., of the value of £324 6*s.* 4*d.* In 1895 these figures rose to no less than 5,069,576 lbs., of a total sterling value of £269,893.

"So far back as 1882, Sir Alfred Moloney, K.C.M.G., to whom is due the credit of starting the industry on the Gold Coast, had suggested the possibility of a similar industry in Lagos, but it was not until 1894 that any progress became apparent. In that year the Governor of Lagos, Sir Gilbert Carter, K.C.M.G., issued the following notice:—

"'His Excellency the Governor desires to notify to the mercantile community of Lagos that he has been able to induce a party of natives from the Gold Coast, experienced in rubber collecting, to come to Lagos, with a view to the development of this valuable and important industry. The men have already inspected certain districts, which they report to be rich in rubber-producing plants, and it is confidently hoped that Lagos will shortly be able to compete with the sister Colony of the Gold Coast in the great export of the product.'

"This confident hope was quickly justified. Merchants took up the idea with enthusiasm. With startling suddenness the easy-going native awoke to the fact that wealth abounded in the forests round him, and learnt for the first time that in sitting under his own fig tree he had been unconsciously reposing in the shade of the family bank.

"There is, unhappily, reason to fear that the usual result may follow this sudden discovery. Already there seem to be grounds for the belief that, in so far as the term 'rubber industry' implies the intelligent growth and cultivation of the plant for profit, it conveys a false impression of the methods in vogue in the interior.

"Judicious tapping with due regard to the life of the tree, and its future usefulness, is the exception; rubber-bearing trees are ruthlessly sacrificed by irresponsible seekers after wealth, and dead trunks are becoming a too familiar feature in the landscape of the productive districts. Sooner or later a purely destructive policy of this kind must exhaust the richest country; adventurers will have to stray further afield, and the cost of transport will equal or exceed the value of the article."

Agriculture.

"The cultivation of coffee is still in its infancy in the Colony, but the Ilaro Plantation Company are continuing their operations with every prospect of success. The variety principally cultivated is the Liberian, but a few Arabian trees are being raised experimentally. The managers of the Ilaro Company report that they have 150 acres planted with 50,000 coffee and 6,000 cacao plants, while the Ajilete Company have over 60,000 of the former and are also turning their attention to the cultivation of cacao and kola nuts.

"A few yam or cassava farms surround almost every native village, but it is impossible to estimate the acreage so cultivated. Incidentally these small plots, in conjunction with a very nasty smell, serve the useful purpose of announcing to the traveller the proximity of human habitations. Besides the all-important palm oil and kernels, kola nuts, beniseed, ground nuts, and piassava are among the produce of the Colony."

DLXXXVIII.—BRITISH SOLOMON ISLANDS.

According to the *Colonial Office List*, 1897, p. 306, these islands were placed under British protection in 1893, and a Resident has lately been appointed. His head-quarters will be at Tulage, a small island which has been purchased for the purpose of establishing a Residency. The British or Southern Solomon Islands "consist of the Islands of New Georgia, Guadalcanar, Malaita, San Christoval and small islands in the vicinity of the above lying between the 7½th and 13th degrees of south latitude, and the 150th and 163rd degrees of east longitude. The natives are Melanesians. They are treacherous, and most of them are cannibals. There are a few resident traders, mostly of British nationality. A large number of natives used to go to work in plantations in Queensland, Fiji, and Samoa, returning after the expiration of three years, but the number is less than formerly.

"The principal articles of trade are copra, pearl shell, and tortoise shell. The climate is not a good one."

During the last few years the botany of the Solomon Islands has been studied at Kew, and collections of dried plants have been received from the Rev. R. B. Comins, Dr. H. B. Guppy, and from the officers of H.M.S. "Penguin," communicated by Admiral Sir W. J. L. Wharton, K.C.B., F.R.S., Hydrographer of the Admiralty. The more interesting plants have been described in the *Annals of Botany* (vol. v. (1891), pp. 501–508, t. 27 ; vol. vi. (1892), pp. 203–210, tt. 11–14) ; *Journal of the Linnean Society* (vol. xxx. (1894), pp. 163–165 and 211–217, tt. 9–11) : *Hooker's Icones Plantarum* (4th series, iii. (1894), tt. 2207, 2247, and 2248) ; and the *Kew Bulletin* (1892, 105 ; 1894, 211–215 ; 1895, 132–139, 159–161).

An account of the present condition of the Solomon Islands is contained in the *Colonial Reports* (Miscellaneous, No. 8, 1897) by Mr. C. R. Swayne, the first British Resident. The following information is extracted :—

"From inquiries instituted, both in Sydney and in the Protectorate, I find that the exports to Sydney for 1895 and for the present year will stand approximately as follows :—

Year.	Copra.	Ivory Nuts.	Pearl Shell.		Turtle Shell.	Beche de Mer.	
	Tons.	Tons.	Tons.	Cwt.	lbs.	Tons.	Cwt.
1895	1,200	586	6	10	891	7	18
1896	1,383	610	8	9¼	1,379	3	15

Copra.

"Copra always has been, and is likely for many years to come to supply, the chief article of export. Solomon Islands copra is what is known as smoke-dried and consequently does not command so good a price by from 10*s*. to 1*l*. a ton in Sydney as sun-dried copra in consequence of its dirty appearance. I was, however, informed by an expert in Sydney that Solomon Island

copra is particularly rich in oil, and I see no reason why the more usual system of sun-drying should not be resorted to. From the natives' point of view smoke-drying is less trouble and they have become wedded to the practice, but should cocoanut-planting under white management be entered upon, it is not to be supposed that any system but sun-drying, or perhaps even the superior one of kiln-drying, would be followed.

"The output of copra from the Protectorate might be very largely increased. I have no hesitation in saying that with the existing trees at least double the quantity of native-made copra might be produced, and this without in any way stinting the natives in the quantity they require to use for food. The quantities of sprouting and wasted nuts that may be noticed at any time under a cocoanut grove in the Solomons is such as would make the mouth of a Samoan or Fijian water with envy. The fact is, however, that the natives have so few wants, and these are so easily supplied, that a small proportion only of the crop of nuts suffices to satisfy them, and the remainder is allowed to go to waste. I consider that of all the natives of the Western Pacific with whom I have come in contact the Solomon Islanders of the British Protectorate are able to supply their demand for articles of foreign trade with the least exertion.

"In preparing the copra for sale to the traders the natives cut the nuts in half and the divided nuts are then smoked in a fire. When sufficiently dry the cup-shaped kernels come away from the shell. These are strung upon strings supposed to contain 10 nuts each, or rather 20 half-nuts. The price for a string of copra supposed to contain 20 half-nuts is one stick of tobacco, or its equivalent, which costs the traders rather more than a half-penny. It is safe to assert that the strings of copra never contain the full number when tobacco is the purchasing medium. During my previous residence in the Solomons, from 1886 to 1889, strings containing 16 or 18 half nuts were considered very good, but during the present year I saw a string containing so few as seven half nuts tendered and accepted as a full string. In fact the natives are supplying their wants too cheaply, and the better class of traders have admitted to me that the imposition of duties or trading licenses will actually benefit the trade by forcing them to raise the price of their goods and so compelling the natives to make more produce.

"At the present price of copra in Sydney I consider that if a trader makes 2*l.* a ton profit upon the copra collected by him he has done very well, and off this must be taken the expenses of collection.

Ivory Nuts.

"These nuts are the fruit of a palm (*Metroxylon Amicarum*), one of the sago-yielding palms. The species is, I believe, peculiar to the Solomons, and grows wild throughout the group in inexhaustible quantity. The nuts are exported as vegetable ivory and are used for making buttons and similar small articles. Some years ago I made inquiries in London as to the market for these nuts, and ascertained that they were known in the trade as 'apple nuts,' and that three Birmingham firms occasionally used them. I was informed that the chief obection to them was the

hollow core through the middle, and their reluctance to take a black dye. More went to Germany and Vienna than to London. About three years ago the price of these nuts suddenly jumped from about 3*l*. a ton in Sydney to 12*l*., at which price a considerable quantity were sold, and the market probably overstocked. Their value has now relapsed to about 5*l*. per ton in Sydney, at which figure there seems to be a good demand. The sudden inflation in value was due, so I was informed, to the demand of a Vienna firm, who used a considerable quantity for making the wheels of roller skates.

"I consider that there will continue to be a demand for a fair quantity at about present prices, with perhaps occasional rises. Should the demand for these nuts increase, the quantity shipped could be very largely augmented.

AGRICULTURE.

"Under this head, I shall refer only to such enterprises as have been undertaken by white residents, native planting operations being of the usual kind to be met with in the Western Pacific. As a locality for the growth of the cocoanut palm, I believe the British Protectorate of the Solomons presents advantages unequalled by any place that I have hitherto visited in the Western Pacific. Situated as it is within the parallels of 7° to 11° of south latitude, it is outside the region of the devastating hurricanes that occasionally visit the New Hebrides, Fiji, Samoa, and Tonga, whilst it is also exempt from those long periods of drought that are experienced among the islands of the Gilbert group. The appearance of the miles of cocoanut palms fringing the beach on the north coast of the Island of Guadalcanar and along the shores of the Rubiana Lagoon and elsewhere in New Georgia prove that the climate and soil of the Protectorate are eminently suited to the production of cocoanuts. So far the only attempts by white men at cocoanut planting have been by the owner of Gera Island, off the coast of Guadalcanar, by the Marau Company at Crawford Island in Marau Sound, by the same company upon a piece of land of about 30 acres on the mainland at Aola on Guadalcanar, and by Mr. Neilson, the trader, at Gavutu, upon his island of that name. The plantations of the Marau Company are at present too recent to have yet come into bearing, but at Gavutu, where, when I left in November, 1888, no palms had been planted, there is now a plantation of about 15 acres in full bearing. I can safely say that, in spite of the fact that the trees cannot be more than seven years old, I never saw cocoanut palms bearing more heavily, and this is the case not with selected trees but with the whole plantation. They are planted in lines at a distance of 30 feet by 30 feet, a system which gives nearly 50 trees to the acre. The Marau Company have lately acquired the two uninhabited islands known as North Island and Symonds Island, near Marau Sound, and are at present clearing them with a view to cocoanut planting.

"There are hundreds of small low flat islands throughout the Protectorate composed of sand and decomposed coral with a covering of vegetable humus most eminently suited for cocoanut planting, among which I may mention the long reef islands extending along the south coast of Malaita and several islands along the northern coast, especially the large island of Leile,

which has been vacated by the natives ever since the attack upon the labour ship "Janet Stuart," several islands and bays at the west side of Russell Island quite deserted by the natives through fear of the New Georgia head-hunters, numberless uninhabited and most fertile islands in the Marova Lagoon, the whole of Gizo Island and adjacent islets, quite uninhabited, and numerous small islands near Wana-Wana. The Marau Company have within the last two or three months commenced work upon a large block of land purchased by them on the north coast of Guadalcanar about six miles from Marau Sound. The situation appears to have been well selected, the land being of the first quality. It is proposed to grow cacao, coffee, both Arabian and Liberian, Vanilla, and other products. Seedlings of the two former have been raised at the Company's head station at Marau Sound and were being removed to the plantation at the time I left the Protectorate in October.

"The Company have had some difficulty in procuring seeds of cacao, although the tree had been introduced to the Solomons some years ago by the late Mr. Stevens of Ugi. I found about a dozen trees growing in the trader's garden at Ugi in sour undrained soil. They appeared quite neglected, and although bearing fairly well appeared to be badly diseased. For this reason Mr. Svensen of the Marau Company had been unwilling to use seed from these trees. Upon a closer examination, I found their sickly appearance due to the ravages of the wood-boring larva of a large species of longicorn beetle. It appeared to start its attack near the ends of the young branches and work downwards through the heart of the branch. The branches affected quickly responded to the attack of the larva by presenting an unhealthy appearance, so that I think that in a properly tended plantation there would be no difficulty in keeping the trouble in check by pruning.

"The Marau Company is also planting bananas with a view to shipment, and it is expected that the first shipment will be made about the middle of 1897. As Marau is one of the last places of call of the steamer "Titus" and the voyage to Sydney is made from that place in from seven to eight days, it will be seen that the east end of Guadalcanar is as favourably situated as Fiji or Queensland for supplying the Sydney market. The trader Sheridan, at Makira Harbour on San Christoval, also announced to me in June his intention of planting bananas for export, and I believe a commencement has already been made.

"Mr. Maben, at present a visitor to the Protectorate, will probably embark in the enterprise of coffee planting.

India Rubber.

"During the present visit to the Protectorate I made several experiments with a view to the production of india rubber, the trees experimented upon being chiefly various species of parasitical *Ficus*. I regret to say that my experiments were unsuccessful. I was, however, shown by one of the Aola traders, who had just returned from British New Guinea, some samples of rubber now being procured there by the natives. The man who showed me the samples said that he had seen the same tree as that from which they were produced growing in the Solomons, and from

his description it appears to be also a species of *Ficus*. The natives of New Guinea, the trader told me, allowed the sap of the tree to run over their arms and body and when it was sufficiently solid removed it and rolled it up into lumps. The lumps were rather larger than a cricket ball and it was worth to the New Guinea traders from 2*s*. 6*d*. to 3*s*. per lb.

Sago.

"A species of sago palm grows wild throughout the Solomon Group in inexhaustible quantities, the nuts being exported as vegetable ivory, as described above. So far no attempt has been made to utilise the sago contained in the pith of the tree. The natives of Shortland Island and Treasury Island understand the extraction and manufacture of the sago flour and it is extensively used by them as an article of food. They wash the pith in salt water and bake the resulting sago into cakes wrapped in leaves, frequently with the addition of pounded almonds. These cakes, as I can testify, are most excellent and sustaining food. From their portability, they are taken by the natives upon canoe voyages as they are not liable to damage by salt water and, moreover, are most convenient to sit upon. In the more eastern portions of the group the natives do not understand the manufacture of the sago, but in times of scarcity they bake lumps of the pith itself, and they tell me it is not unpalatable food.

"During my stay this year at Ugi, while waiting for the return of H.M.S. "Pylades," I made experiments in the manufacture of sago. I selected a tree which was just sending up its spike of flowers and with an axe made an incision in the trunk from which I chipped out about a bushel of the soft white pith. This I carried to a stream and grated up the lumps of pith in a bucket of water. I poured the resulting milky water through a piece of muslin into another bucket and allowed it to settle. The sago quickly settled on the bottom, when I poured off the water and removed the sago and dried it in the sun. I took the sample with me to Sydney, and was told that as starch alone it would have a value of at least £8 to £10 per ton. Even at this low price it might pay to manufacture on a large scale. The trees are in great quantity and a small apparatus for grating the pith, worked by water power, and wooden settling troughs might be erected at very trifling expense. But apart from any commercial value it may possess, the natives should be taught its use as food."

Canes.

"Canes suitable for making baskets occur everywhere in the bush and reach a great length. Some have lately been sent to Sydney in consequence of an inquiry for them.

Timber.

"Sandal wood has never, so far as I know, been found in the Solomons, but a very dark wood resembling ebony is found in fair quantities on New Georgia, and would probably be valuable for cabinet making."

DLXXXIX.—SHINIA IN CYPRUS.

(*Pistacia Lentiscus.*)

In 1896, specimens of plants known in Cyprus as "Shinia" and "Mastiches" respectively, were received from Mr. A. K. Bovill, Principal Forest Officer in Cyprus. The first named was determined to be typical *Pistacia Lentiscus*, and apparently identical with the plant yielding the Gum Mastich of the Greek Archipelago, chiefly in Chio (the modern Scio). The "Mastiches" was regarded as simply a broad-leaved variety of the same species. In some localities in Cyprus the trees of *Pistacia Lentiscus* are tapped, "but the gum which exudes is without colour and without taste." The trees yielding mastich in Scio are said to be exclusively *male*. According to Mr. Bovill, the Shinia "grows more or less all over Cyprus, from the sea-level to an altitude of 2,500 feet, and most luxuriantly through the Carpas, all along the northern shore of the island as far as Ryrenia, all over the Rormakiti Cape from Lefka to the village of Peyia, and from Rouklia, in the Paphos district, all along the southern coast to Mazoto, in the Larnaca district. Practically speaking, the supply is unlimited, for as fast as it is cut down it shoots up again from the stools.

"Mr. Christian, of the Cyprus Company, Limited, Limassol, writing to me on the subject, says:—'We have been for some years past trying to find a market for this article, and have succeeded in introducing it to one or two firms in the north of England, but thus far the demand for it is limited, and does not exceed 100 to 150 tons per annum. Like Sumach, the Shinia leaves contain tannic acid, but to a less degree, and the material has been found of value for fixing dyes. . . . . Our buyers prefer to have the Shinia in the leaf, and we have therefore ceased grinding it, and now ship it in pressed bales.' He adds, 'I feel confident that a large demand would grow up for this product should its qualities become more widely known, but unfortunately it is extremely difficult to persuade English manufacturers to try new products.'"

Further information is contained in the following correspondence received from the Government of Cyprus:—

THE CHIEF SECRETARY, CYPRUS, to ROYAL GARDENS, KEW.

Chief Secretary's Office, Nicosia.
January 6, 1897.

SIR,

I HAVE the honour to transmit to you a copy of a report which has been prepared by Mr. Gennadius, the Director of Agriculture, dealing with the cultivation of Shinia leaves.

I shall have pleasure in forwarding to you copies of similar pamphlets as they appear, relating to agricultural or economic subjects.

I am, &c.,
(Signed) ARTHUR YOUNG.
Chief Secretary.

The Director,
Royal Gardens, Kew.

Report on Shinia Leaves.

Pistacia Lentiscus is the shrub that grows abundantly in most parts of Cyprus, and is called in the island *Shinia*. A cultivated form of this Shinia which is so commonly met with here is the mastic shrub of Chio (the modern Scio). The leaves only of the Shinia have a commercial value, as they serve as a tannic and dyeing substance.

From the wood of this shrub charcoal of good quality is made, and from its seed, which is eaten readily by goats and pigs, oil can be extracted which would be good for burning purposes, and could, in case of necessity, be used for food as well.

For some time Shinia leaves were exported from Cyprus to England by the Cyprus Company, but they were exported in small quantities, and, as I understand, the price that was paid to those who collected them was 8 paras per oke.

But the principal market for Shinia leaves is Palermo, in Sicily, to which there is an annual exportation from Tunis of about ten thousand tons. The Shinia leaves serve at Palermo, chiefly, for the adulteration of Sumach (*Rhus Coriaria*),* which is grown in large quantities in Sicily, and is exported to England and France, principally through Palermo.

A good quantity of Shinia leaves is also consumed at Lyons, France, as a dyeing material for silk stuffs.

The course, then, we must pursue, is to get the Shinia leaves, of which there is an abundant yield in Cyprus, into those two markets.

Dry Shinia leaves are bought at Tunis by Italian merchants at 2½ francs (2 shillings) for every 100 kilogrammes (78 okes), and being packed in sacks, are sent to Palermo, where they are sold at 4½ to 7 francs (3 7 to 5 7) for every 100 kilogrammes.

The Shinia leaves are collected from the month of April to the month of September. For that purpose the leafy branches of the shrub are cut off and laid in heaps on the ground and left there until they dry. Usually they dry in four or five days, during which the heaps are not disturbed, so that as few leaves as possible should come into direct contact with the sun, whose effect is to bleach and overdry them, thus depreciating their value.

After being dried, the branches are beaten with the flail, so that the leaves get detached; the leaves are then placed in sacks and brought to the market for sale. Before the beating takes place, the top branches which cover each heap are removed and thrown away, because the leaves of those branches being bleached and burnt by the sun, are not only useless but also become injurious when they are rubbed and mixed with the rest of the produce. Shinia leaves should not be collected after rain, because then a produce of inferior quality is obtained.

P. G. Gennadius,
Director of Agriculture.

9th December, 1896.

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* See *Kew Bulletin*, 1895, p. 293.

DXC.—SLIME-FLUX.

An obscure disease, which appears to be very destructive to young fruit-trees, has been recently the subject of careful investigation at Kew. Originally described by Ludwig in 1888, it is briefly discussed in Tubeuf and Smith's *Diseases of Plants* (1897), who express some doubt as to the organism causing the disease and as to its fatal character. The following account, however, seems to leave little room for doubt in the matter :—

REPORT on a diseased plum tree sent to Kew for examination by Spencer Pickering, F.R.S. Mucilage-flux ; Schleimfluss, or L'Ecoulement des Arbres fruitiers.

The colourless mucilage escaping from injured portions of diseased plants contains a Schizomycete—*Micrococcus dendroporthes*, Ludwig ; this appears to be invariably accompanied by the early, aquatic condition of a fungus (*Torula monilioides*, Corda), the subglobose cells of which float in the hyaline mucilage, and impart to it a brown colour. Inoculations with pure cultures of both these organisms demonstrate conclusively the following points : —

(1.) The *Micrococcus* is alone capable of inducing fermentation in the living wood of the host-plant, and must, therefore, be considered as the active agent in causing disease.

(2.) The *Micrococcus* is not able to set up a disease when placed on uninjured bark, however young, but does so readily and constantly when placed on a wounded surface of wood or bark.

(3.) The disease is quite as readily imparted to apple trees as to plum trees.

Shortly after inoculation the diseased portions of wood assume a reddish-brown colour, and finally become quite soft and disorganised. At a later stage scattered patches of bark are destroyed from within, forming suppurating wounds through which the mucilage, formed during fermentation of the tissues, oozes to the surface.

Such wounds present very suitable starting-points for the growth of various wound-fungi, as *Polyporus*, *Nectria*, etc.

The mucilage, charged with *Micrococcus* and *Torula*, situated on the surface of the bark, is readily dispersed by wind and rain, field-mice and other rodents, work-tools, etc., access being gained to the living tissues of the host-plant through wounds such as broken branches, eroded bark, and insect punctures. In the example sent to Kew for investigation, inoculation had taken place at the surface of two pruned branches, which presumably had not been properly protected by the application of tar to the cut surfaces.

G. M.

August 12, 1897.

DXCI.—MISCELLANEOUS NOTES.

MR. RICHARD MENTZEL, formerly a member of the gardening staff of the Royal Gardens, has been appointed manager of the rubber plantations of Mr. Wolf Carlis, at Johannesburg, South African Republic.

Mr. Horace Walter Leighton Billington, Curator of the Botanic Gardens (Station) at Old Calabar, in the Niger Coast Protectorate, died in November, the news reaching London on the 19th. He was youngest son of the Rev. J. H. Billington, rector of Chalbury, Dorset. After spending three years in the service of the Royal Niger Company, he entered that of the Government in the Niger Coast Protectorate. Arriving in Old Calabar on March 20, 1893, he created under Sir Claude Macdonald "the botanic station that he was just starting, for the purpose of ascertaining what economic plants were suitable for cultivation in the Protectorate, and to encourage the natives to grow them, as well as an example for them to see how useful plants should be planted and grown."

His first report, from which the above is quoted, was made to the Commissioner and Consul-General, February 24, 1894. It is printed in the papers (Africa, No. 1) presented to Parliament in 1895. It includes a remarkable list of the economic plants which Mr. Billington had succeeded in gathering together, many having been obtained from the West Indies, as well as the other West African stations.

A scheme for the establishment of the station had been presented to the Foreign Office by Kew in 1891, at the request of the Marquess of Salisbury. The objects which Sir Claude Macdonald hoped to obtain through it are quoted in the *Kew Bulletin* for 1895 (p. 164).

Besides the report on the station, the papers also contain a report by Mr. Billington on the botany of the country lying to the eastward of the Old Calabar River, and a similar report of the bank of the Cross River.

Mr. Billington had borne the climate remarkably well, but he resigned in July of last year, and was only awaiting the appointment of his successor to return to England. His untimely death at the early age of twenty-eight closes a career of much usefulness and promise. But as the pioneer of new cultural industries in the Niger Protectorate it may be hoped that his memory will long be preserved.

Botanical Magazine for November.—*Mammea americana*, a native of the West Indies, is cultivated in tropical America for the sake of its edible fruit, the mammee apple. The plant in the Economic House at Kew flowered in 1896, but did not produce fruit; the figure of the latter was therefore prepared from a specimen in the Museum, which had been received from C. D. Sturge, Esq., of Montserrat. *Tainia penangiana* was communicated to Kew by Mr. C. Curtis, F.L.S., of Penang. It has pale yellow sepals and petals, each with five to seven red nerves, and a nearly white lip. *Cynorchis grandiflora*, from Madagascar, has rather pretty flowers, and all the green parts of the plant are streaked with blood-red. The plant figured was obtained from Messrs. Lewis & Co., of Southgate. *Drimia Coleæ* is a new species, flowered at Kew from a bulb brought from Somaliland by Miss Edith Cole. *Scoliopus Bigelovii* is a singular liliaceous plant from California. The flowers give off an odour resembling that of decaying sea-weed.

Flora of British India.—The completion, by the issue of the twenty-second part, of this important contribution to our knowledge of the existing vegetation of the world was announced above (pp. 205, 206). A general index to the whole work was published in November last.

Pelican.—The specimen of *Pelicanus onocrotalus* presented to Kew in 1896 by the Zoological Society (*K. B.*, 1896, p. 98) unfortunately succumbed to an incurable disease in the following winter. The remaining bird, also of the same species, had been given to the Royal Gardens in 1890 by the late Lord Lilford. It had become extremely tame and a very popular pet with the visitors.

Although from time to time feather-pinioned, during 1897 it eluded efforts to catch it. In October last it flew away to the Thames, and for some time established itself on the reservoir of the West Middlesex Waterworks, at Barnes. All attempts to recapture it were unfortunately unsuccessful. It was also heard of at Southall. It eventually left the Thames valley and flew southwards.

Mr. D. N. Olney, of Blenheim House, Robertsbridge, Sussex, was so good as to send to Kew the following "cutting" from the *Kent and Sussex Post* of October 16, which records the fate of the unfortunate bird. This will, at any rate, serve to commemorate the hospitality to an interesting visitor of Mr. Percy Tew, his game keeper, and the "sagacious animal" Jock :—

"On Saturday last a huge bird was seen in Brightling Park, and observed to settle in the Saw Mill pond and drink copiously, as though famished. It took little notice of persons watching it, and the keeper, Mr. Hewett, arriving shortly, shot it in the middle of the pond. On sending his dog to fetch it out, 'Jock' appeared to shy at such big game, but after a few minutes and plenty of encouragement the sagacious animal seized the bird by the neck, and, placing his body under it, swam ashore with it on his back, much to the amusement of those who witnessed it. The bird is a splendid specimen of the pelican tribe, in fine condition and plumage, measuring 9 feet 10 inches from tip to tip of wings, 5 feet 9 inches from beak to tail, and 3 feet round the body. The bill was 15 inches in length and opened to a width of 17 inches. Weight 21 pounds. We hear the bird has been sent to Percy Tew, Esq., the owner of the park, who will no doubt have it preserved as a curiosity, and certainly a rarity in this part of the world."

A portrait of the pelican was given in the *Gentlewoman* for November 13, from a photograph taken at Kew by Mr. Alfred Craske.

Importation of Canadian Fruit.—The exhibition of Colonial fruit at the Colonial and Indian Exhibition in 1886, which was due to the initiative of the Royal Horticultural Society, led to the publication of a series of papers, the result of official enquiries directed by the Secretary of State for the Colonies, in the *Kew*

Bulletin for 1887 and 1888. The report on Canadian fruit is one of the most important, and is contained in the number for November, 1887 (pp. 4–20). The following passage (p. 19) may be quoted as the historic foundation of what bids fair to become an important commerce :—

"The experience gained during the recent Colonial and Indian Exhibition in London has shown the importance of cold storage* in the transportation of fruit, especially of the early ripening sorts, and it is desirable that facilities in this direction should be offered to the fruit-growers of Canada, so as to stimulate the export of autumn fruits."

The following extract from the *Standard* for September 25 (1897) gives the sequel ten years after :—

"An interesting experiment is being carried out by the Canadian Government, with the view of taking full advantage of the fruit-growing capabilities of the dominion, and putting the best qualities of Canadian "soft" fruits on the English market in competition with the products of Californian orchards. By "soft" fruits are meant in the trade such produce as the best class of table pears, peaches, grapes, and tomatos, and the first cargo reached Covent Garden yesterday, where it was put on sale by Garcia, Jacobs and Co. The Canadian Government have subsidised, under the system they propose to use, the owners of seventeen steamers running to London, Liverpool, Bristol, and Glasgow from Canadian ports, though chiefly from Montreal, to carry the fruit, and have fitted up on the vessels the latest types of refrigerators, in which to stow the goods. The steamship companies are bound under their agreements to carry the fruit at ordinary rates, with only an additional charge of 10s. per ton for the use of the refrigerators. The export of Canadian apples to this country has been a great success, but the import of the best class of pears, for instance, has not been a success. These pears are of the Williams variety, though known in Canada and the States as Bartletts, and are all from sound English stock. The first consignment consisted of 880 cases of pears, peaches and tomatos, and were shipped to Bristol by the steamer "Merrimac." The ship arrived yesterday morning, and the cargo was desptatched in time to be disposed of at Covent Garden in the afternoon. The quality was described by the experts as excellent, both the William pears and the peaches being very fine, but the system employed in packing is such as would prevent the proper ventilation of the contents of the cases. As a result, some of the fruit was more or less out of condition. Mr. Crandall, the representative of the Canadian Minister of Agriculture, inspected the fruit, and was much interested in the opinions expressed in the market as to the need of improved packing. There is no reason to doubt that the Canadian Government officials will take steps to instruct the producers as to a better method of packing. The best to follow is the system employed by the Californian shippers, and there should then be a good sale on the English markets of Canadian produce, especially as it can be brought here at a less cost than the greater part of the fruit from France. Considering the condition of the fruit, the prices realised were regarded as very satisfactory."

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* See also *Kew Bulletin*, 1896, pp. 33–36.

Fruits from Grenada in New York.—The following extract from *Garden and Forest* (New York) for November 17, 1897, affords an illustration of a possible market for the minor products of the lesser West Indian Islands :—

"An interesting collection of tropical fruits reached this city recently from the Botanic Gardens in *Grenada*, a British possession, the southermost island in the Windward group. The consignment was shipped on October 23rd. A delay of ten days in entering the fruits at this port, due to the unusual character of the invoice, and the want of established rates of duty, proved fatal to many of the more perishable kinds, but enough survived to give distinct character to the select stock in one of the fancy fruit stores on Broadway. These West Indian fruits included especially juicy oranges of excellent quality. The tangerines and mandarins were superior, and sold, as did the oranges, at $1.03 a dozen. Among other citrus fruits were lemons ; these were less attractive, being of uneven size, thick-skinned and rough. The limes were remarkably good, and sold for forty cents a dozen. An unusual offering in this city were citrons, the fruits of *Citrus Medica*, familiar to housekeepers in their candied peel ; there were undersized green fruits, and mature ripe specimens ; the latter, cut with a piece of the stem, were lemon-shaped, large as grape-fruits, the rough skin unevenly coloured in shades of lemon and orange. These sold for twenty cents. each. In this unique collection, sapodillas, the fruits of *Achras Sapota*, were fortunate in showing to better advantage for the long time consumed in reaching customers, since these are at their best when more than fully ripened, and the grayish earth-coloured globular fruits were in the juicy sugary stage. They sold for fifteen cents each. A single specimen of the brownish yellow fruit of *Lucuma mammosa* was exhibited, and some of the large brown nuts. Alligator pears were among the fruits lost through the delay, and the few bananas which were yet edible were remarkably good in quality, the yellow fruit of medium size having a rich, creamy-white flesh, while the red bananas were of especially fine flavour. The latter, one of the most rare of all fruits in this market, since the supply was cut off by the Cuban war, found eager purchasers at $1.00 a dozen. Several bundles of stick cinnamon also sold readily.

Victoria Herbarium.—At the close of 1896, the Government of Victoria appointed Mr. J. G. Luehmann, F.L.S., Curator of the "National Herbarium" at Melbourne, in succession to the late Sir Ferdinand Mueller, K.C.M.G., whose death on October 9th, 1896, was recorded in the *Kew Bulletin* for that year (pp. 218, 219). The Melbourne Herbarium, which is termed national in common with other institutions under the same minister, must always be the leading botanical institution in Australasia. It comprises the collections made during a long series of exploring expeditions on the continent of Australia, besides innumerable contributions from external sources, especially Kew, acquired through the indefatigable activity in correspondence of Sir Ferdinand Mueller, the late Government Botanist. On the occasion of the Melbourne Centennial Exhibition, in 1888, he published an interesting account of the Herbarium. A building was erected for its reception in 1857, when Sir Ferdinand presented to it all his

private collections formed since 1840. In 1884, the Victorian Government acquired, by purchase, and added to it the Herbarium of Dr. Otto Wilhelm Sonder, of Hamburg, one of the authors of the *Flora Capensis*, who died in 1881.

The Melbourne Herbarium is of peculiar value from a scientific point of view. It contains the authentic types of all the vast number of Australian and other plants described by Sir Ferdinand Mueller during a long period of incessant and prolific labour. The value of the Australian collections is still further enhanced by their having been successively transmitted to Kew for the use of Mr. Bentham during the preparation of the *Flora Australiensis* (1863–78). In the preface to the last volume of that work, Mr. Bentham writes:—"He [Sir Ferdinand Mueller] has regularly transmitted to me, arranged for each volume, the vast stock of Australian specimens collected by his own exertions, as well as by the able collectors he has employed, and the numerous residents and other correspondents whom he had inspired with a love for the science. . . . . . The specimens, having been worked up, have been successively returned, and the numerous consignments have reached Melbourne without a single loss."

The Australian collections have thus a double authenticity. Taken as a whole, it cannot be doubted that the Melbourne Herbarium. to use the words of its distinguished founder, to whom it may be hoped it will ever remain as an enduring monument, is "on a par with the very few really grand herbaria in existence."

White Willow.—A note on the Huntingdon or White Willow (*Salix alba*, *L.*) has already been published in the *Kew Bulletin* (1895, pp. 239–40). It was pointed out that the demand for the timber was so great that there was great difficulty in procuring suitable wood, especially for making cricket bats. The following additional information on the subject is taken from the *Timber News*, of October 9, 1897:—

"It is not to be wondered at that the best quality of willow timber suitable for the manufacture of cricket bats has of late been selling at prices never dreamt of in the days of our forefathers. From 2*s*. 6*d*. to 5*s*. per cube foot has quite freely been given for 'maiden' (unpollarded) willow timber, if of sufficient dimensions for the making of the best class of bats; and it is little wonder that such paying prices have tempted owners of goodly-sized trees to have these placed on the market, as well as the owners of damp and not too valuable land to speculate in planting so rapid-growing and valuable a timber tree. Only this week fully 100 trees of 'maiden' willow were to be disposed of by tender at Wickham Hall, in Essex, and it is pretty certain that competition was unusually keen, and the money offered comparatively high. We at present know of three buyers of good clean willow timber, the price not being so great an object as the particular size and quality of the wood, which, for the special purpose of cricket bats of the first quality, must be without spot or blemish. We have sold large quantities in bygone days of willow timber for the purpose of converting into boarding for the bottoms of carts used in the conveyance of stones or brick, the wood having the valuable quality of tearing out rather than

splintering. But at present little, unless of very second-rate quality, goes for that purpose, the bat industry swallowing up every bit that can be procured. Fortunately, the cricket bat manufacturer is not wholly dependent on British-grown willow, much of excellent quality being sent from various parts of the Continent.

"When we consider that the first quality of willow timber can be grown on land that would be too damp for the ordinary farm crop, that plants and cuttings can be got at a very nominal rate, that the tree is not subject to disease, at least to any great extent, grows with great rapidity, and is perfectly hardy, added to which is the commercial value of the timber, it is not surprising that farmers and landowners have been turning their attention to it of late, and that already a goodly acreage is now under that crop in various parts of the country."

Calostemma album, R. Br.—In the *Kew Bulletin* for 1892 (p. 72) the introduction to Kew is recorded of bulbs of this rare and interesting Amaryllid. They were forwarded by the late Sir F. von Mueller who had received them from the Hon. J. Douglas, C.M.G., by whom they had been collected whilst on a visit to Turtle Islands. They flowered at Kew in 1894, and proved to be *Eurycles sylvestris*. On being informed of this, Sir F. von Mueller took steps to secure bulbs of the true *Calostemma*, and forwarded some to Kew in 1895. These flowered in September this year and again prove to be the *Eurycles*. Mr. F. M. Bailey, Colonial Botanist, Queensland, writes :—"July, 1897. I have lately been over Thursday Island, and, although I looked carefully, I could not find the *Calostemma* . . . . . I fancy *Eurycles sylvestris* was sent for it."

Nothing seems to be known of this interesting species since it was collected in 1803 by Robert Brown, on Flinders' voyage. It was figured from specimens collected by him in the Kew Herbarium in *Hooker's Icones Plantarum*, t. 2371.

Assam rubber in Egypt—The following correspondence gives the promising result of an attempt to produce rubber from *Ficus elastica* in Egypt :—

Mr. FLOYER to ROYAL GARDENS, KEW.

SIR, Cairo, May 2, 1897.

THANK you very much for the seeds of *Ficus elastica*. I have put in this spring some 50,000 cuttings, and about 96 per cent. are doing well, owing to favourable weather. But, according to Indian experience, the tree does better from seed.

We need millions of trees as shade for the new agricultural roads, and some of them may well be rubber producers, in view of the fact that the present supply is obtained in great measure through the destruction of the trees.

The trees here yield more freely than those of the Chardwar experiment. I have posted a small sample of the India-rubber. The product is very uniform, and a small sample is as good as a large one.

Will send you shortly some gutta from *Calotropis*.

Yours, &c.,

(Signed) ERNEST A. FLOYER.

MESSRS. HECHT, LEVIS, and KAHN TO ROYAL GARDENS, KEW.

21, Mincing Lane, London, E.C.,
May 19, 1897.

DEAR SIR,

WE have your favour of yesterday; also a sample of rubber. It is equal in quality to the fine Darjeeling Assam, and if it comes here exactly like this sample, equally strong and pure, it would at the present moment sell at 2*s*. 6*d*. per lb., and such rubber could be readily sold at any time.

Always at your service, we are, dear Sir,
Yours, &c.,
(Signed) HECHT, LEVIS, and KAHN.

Laportea canadensis.—A nettle-looking plant was received last year from the *Jardin d'Acclimatation* at Paris, under the name of *Bœhmeria candicans*. It was said to afford fibre superior in quality to China-grass (*Bœhmeria nivea*), or rhea or ramie (*B. tenacissima*), and its cultivation has been recommended in Southern France, Algiers, Egypt, &c. Fortunately, the plant on arrival at Kew was in excellent condition and in flower. Upon examination it was found to be not a species of *Bœhmeria*, but a well-known new-world species, *Laportea canadensis*, extending from Canada to Florida and Mexico, and westward to the Rocky Mountains. The fibre yielded by this plant was at one time largely used; latterly it has been almost entirely forgotten. In Hooker's *Flora Boreali-americana*, Vol. II. (1840), p. 142, it is stated, "the fibre of the stem is copious and strong, and Mr Whitlaw endeavoured to recommend it to this country as an article of commerce." Later, in 1865, the Abbé Provancher refers to it in his *Flore Canadienne*, p. 516, under the name of *Ortie du Canada*, or Canada Nettle, and adds:—"Sa culture a été tentée en Europe pour sa fibre, mais ses avantages reéls sont encore doutés."

It is well known that many members of the nettle order are capable of yielding fibre. Even the common English stinging nettle (*Urtica dioica*) is a very ancient fibre plant, its inner bark affording a tough fibre suitable for many purposes, and used for cordage and coarse cloth. A lace parasol cover partly made from this fibre is in Museum I., Case 102. A series of yarns prepared from the same plant, and variously coloured, were brought to Kew by Mr. B. Gray, of Glenanne, Ireland.

In the *Descriptive Catalogue of Useful Fibre Plants of the World*, by Mr. C. Richards Dodge, recently issued by the United States Department of Agriculture, the following note (p. 213) appears respecting *Laportea canadensis*:—"The fibre of this species, before the introduction of cotton, had an application more extensive than at present in Europe, where, particularly in Germany and in more northern countries, they manufactured the cloth called *ortica* (German, *nesseltuch*), or nettle cloth."

It may, therefore, be safely assumed that the Canada nettle possesses no special merit as a fibre plant compared with China-grass or ramie. Further, as it possesses stinging hairs, it is difficult to handle.

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ROYAL GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

APPENDIX I.—1897.

LIST OF SEEDS OF HARDY HERBACEOUS PLANTS AND OF TREES AND SHRUBS.

The following is a list of seeds of Hardy Herbaceous Annual and Perennial Plants and of Hardy Trees and Shrubs which, for the most part, have ripened at Kew during the year 1896. These seeds are not sold to the general public, but are available for exchange with Colonial, Indian, and Foreign Botanic Gardens, as well as with regular correspondents of Kew. No application, except from remote colonial possessions, can be entertained after the end of March.

HERBACEOUS PLANTS.

Abromia umbellata, *Lam.* California.

Acaena cylindrostachya, *Ruiz & Pav.* Chili.
macrostemon, *Hook. f.* N. Zealand.
microphylla, *Hook. f.* N. Zealand.
myriophylla, *Lindl.* Chili.
ovalifolia, *Ruiz & Pav.* Peru, &c.
pinnatifida, *Ruiz & Pav.* Chili.
Sanguisorbae, *Vahl.* New Zealand.
sericea, *Jacq.* Mexico.

Acanthus longifolius, *Poir.* S. Europe.

Achillea Ageratum, *L.* Europe.
compacta, *Willd.* S. E. Europe.
decolorans, *Schrad.* Europe.
filipendulina, *Lam.* Orient.

Achillea—*cont.*
ligustica, *All.* Eur., Orient.
Millefolium, *L.* Northern hemisphere.
nobilis, *L.* Europe.
Ptarmica, *L.* Northern hemisphere.
rupestris, *Huter.* Calabria.
setacea, *Waldst. & Kit.* Europe.
taygetea, *Boiss. & Heldr.* S. E. Europe.
umbellata, *Sib. & Sm.* Greece.

Aconitum ferox, *Wall.* Himalaya.
heterophyllum, *Wall.* Himalaya.
Lycoctonum, *L.* Europe, &c.
Napellus, *L.* N. hemisphere.
— var. album.
orientale, *Mill.* Caucasus.
palmatum, *D. Don.* Himalaya.

Acroglochin chenopodioides, *Schrad.* Asia.

u 94114. 1375.—11/96. Wt. 123.

Actinolepis coronaria, *A. Gray.* California.

Actinomeris squarrosa, *Nutt.* N. America.

Adesmia muricata, *DC.* Chili, &c.

Adlumia cirrhosa, *Rafin.* N. America.

Adonis pyrenaica, *DC.* Pyrenees.

Ægopogon geminiflorus, *Humb. & Bonpl.* Trop. America.

Æthionema cappadocicum, *Spreng.* Orient.
grandiflorum, *Boiss. & Hohen.* Persia.
saxatile, *R.Br.* S. Europe.

Agrimonia Eupatoria, *L.* N. hemisphere.
leucantha, *Kunze.* Origin uncertain.
odorata, *Mill.* Europe.

Agropyron caninum, *Beauv.* Europe.
dasyanthum, *Ledeb* Russia.
desertorum, *Schult.* Siberia.
glaucum, *Roem. & Schult.* Europe.
pungens, *Roem. & Schult.* Europe.
— var. pycnanthum, *Godr.*
tenerum, *Vasey.* N. America.

Agrostis alba, *L.* Europe.
— var. gigantea, *Roth.*
— var. stolonifera, (*L.*).
nigra, *With.* Europe.
vulgaris, *With.* Temp. regions.

Ajuga Chamaepitys, *Schreb.* Europe, &c.

Alchemilla alpina, *L.* N. hemisphere.
conjuncta, *Bab.* N. W. Europe.
fissa, *Schum.* Alps, Pyrenees, &c.
splendens, *Christ.* Switzerland.
vulgaris, *L.* Europe.

Alisma Plantago, *L.* Europe, &c.

Allium Ampeloprasum, *L.* Europe, Orient.
angulosum, *L.* Siberia.
atropurpureum, *Waldst. & Kit.* Hungary.
Babingtoni, *Borrer.* Britain.
bauerianum, *Baker.* Orient.
cardiostemon, *Fisch. & Mey.* Persia.
carinatum, *L.* Europe.
cyaneum, *Regel.* China.
Cydni, *Schott & Kotschy.* Asia Minor.
Fetisowi, *Regel.* Turkestan.
fistulosum, *L.* Siberia.
flavum, *L.* Europe.
giganteum, *Regel.* Central Asia.
hymenorrhizum, *Ledeb.* Persia.
kansuense, *Regel.* China.
karataviense, *Regel.* Turkestan.
Moly, *L.* Europe.
montanum, *F. W. Schm.* Europe.
narcissiflorum, *Vill.* Europe.
nigrum, *L.* Europe.
odorum, *L.* Siberia.
orientale, *Boiss.* Asia Minor, &c.
ostrowskianum, *Regel.* Turkestan.
polyphyllum, *Kar. & Kir.* Turkestan.
pulchellum, *Don.* Europe.
roseum, *L.* Mediterranean region.
Schoenoprasum, *L.* N. hemisphere.
— var. sibiricum, (*L.*).
scorzoneræfolium, *Red.* S. Europe.
senescens, *L.* Europe, Siberia.
siculum, *Ucria.* Sicily, &c.
subhirsutum, *L.* Europe.
subvillosum, *Salzm.* S. W. Europe.
Suworowi, *Regel.* Central Asia.
ursinum, *L.* Europe, N. Asia.
Victorialis, *L.* Europe, Siberia, &c.

Alopecurus arundinaceus, *Poir.*. Europe, &c.
geniculatus, *L.* N. hemisphere.
pratensis, *L.* N. hemisphere.

Althaea cannabina, *L.* Europe, var. narbonensis, *Pourr.*
ficifolia, *Cav.* Dalmatia.
pallida, *Waldst. & Kit.* Europe.
rosea, *Cav.* Orient.
sulphurea, *Boiss. & Hausskn.* Persia, &c.
taurinensis, *DC.* Dalmatia.

Alyssum argenteum, *Vitm.* Europe.
creticum, *L.* Crete.
gemonense, *L.* Europe.
incanum, *L.* Europe.
maritimum, *Lam.* Europe.
montanum, *L.* Europe, Orient.
orientale, *Ard.* Greece, &c.
podolicum, *Bess.* Europe, &c.
pyrenaicum, *Lapeyr.* Pyrenees.
saxatile, *L.* Europe.

Amaranthus caudatus, *L.* Tropics of Old World.
hypochondriacus, *L.* N. America.
retroflexus, *L.* N. America.
speciosus, *Sims.* India, &c.

Ambrosia trifida, *L.* N. America.

Amethystea caerulea, *L.* Siberia.

Ammophila arundinacea, *Host.* Europe and N. America.

Amsinckia intermedia, *Fisch. & Mey.* California.

Amsonia Tabernaemontana, *Walt.* N. America.

Anacyclus radiatus, *Loisel.* Mediterranean region.

Anagallis arvensis, *L.* Europe, &c.
— var. carnea, (*Schrank*).
— var. caerulea, (*Schreb.*).

Anchusa italica, *Retz.* Mediterranean region.
officinalis, *L.* Europe.

Androsace filiformis, *Retz.* N. Asia, N. America.
lanuginosa, *Wall.* Himalaya.
nana, *Horn.* Europe.

Andryala ragusina, *L.* Mediterranean region.
varia, *Lowe.* Madeira.

Anemone decapetala, *L.* N. America.
multifida, *Poir.* N. America.
pratensis, *L.* Europe.
Pulsatilla, *L.* Europe.
rivularis, *Buch-Ham.* Himalaya.
sylvestris, *L.* Europe.

Angelica dahurica, *Maxim.* E. Asia.

Anoda hastata, *Cav.* Mexico.
Wrightii, *Gray.* Mexico.

Anthemis carpathica, *Willd.* Europe, &c.
montana, *L.* Europe, &c.
nobilis, *L.* Europe.
— var. discoidalis, *Hort.*
peregrina, *L.* Mediterranean region.
tinctoria, *L.* Europe.
Triumfetti, DC. Europe.

Anthericum Liliago, *L.* S. Europe, N. Africa.
— var. algeriense, *B. & R.*
ramosum, *L.* Europe.

Anthoxanthum Puelii, *Lecoq & Lamotte.* Europe, &c.

Anthriscus Cerefolium, *Hoffm.* Europe, Asia.

Anthyllis Vulneraria, *L.* Europe, &c.

Antirrhinum Asarina, *L.* Italy.
majus, *L.* Mediterranean region.
nuttallianum, *Benth.* California.
Orontium, *L.* Europe.
rupestre, *Boiss. & Reut.* Spain.
siculum, *Mill.* Sicily.
tortuosum, *Bosc.* W. Mediterranean region.

Apera interrupta, *Beauv.* Europe, &c.

Aphanostephus arkansanus, *A. Gray.* Texas.

Apium graveolens, *L.* Europe, &c.

Aquilegia chrysantha, *Gray.* New Mexico.
caerulea, *James.* N. W. America.
flavescens, *S. Wats.* California.
glandulosa, *Fisch.* Siberia.
vulgaris, *L.* Europe.

Arabis albida, *Stev.* Mediterranean region, &c.
alpina, *L.* Europe, N. America.
bellidifolia, *L.* Europe.
blepharophylla, *Hook. & Arn.* California.
cebennensis, *DC.* S. France.
hirsuta, *Scop.* var. retziana (*Beurl.*). Europe, &c.
Holboellii, *Hornem.* N. America.
lucida, *L.* Europe.
muralis, *Bert.* var. rosea, *DC.* Europe.
petraea, *Lam.* N. temperate regions.
pumila, *Jacq.* Alps, &c.
Soyeri, *Reut. & Huet.* Pyrenees.
Stelleri, *DC.* var. japonica. Japan.
stricta, *Huds.* Europe, &c.
Turczaninowii, *Ledeb.* Siberia.

Aralia cachemirica, *Decne.* Himalaya.
cordata, *Thunb.* Japan.

Archangelica officinalis, *Hoffm.* Europe, &c.

Arctium majus, *Bernh.* Europe.
— var. Kotschyi, *Hort.*
minus, *Bernh.* Europe.
nemorosum, *Lejeune.* Europe.

Arenaria balearica, *L.* Balearic Isles.
Facchinii, *Hort. Kew.* Tyrol.
fasciculata, *Gouan.* Europe.
gothica, *Fries.* Europe.

Arenaria—*cont.*
graminifolia, *Schrad.* E. Europe, N. Asia.
— var. multiflora.
— var. parviflora.
grandiflora, *L.* Europe.
gypsophiloides, *L.* Asia Minor, &c.
hirta, *Wormsk.* N. Europe.
laricifolia, *L.* Europe.
montana, *L.* Spain, &c.
pinifolia, *Bieb.* Caucasus.
purpurascens, *Ramond.* Pyrenees.
verna, *L.* Europe, &c.

Argemone mexicana, *L.* Mexico.
ochroleuca, *Sweet.* Mexico.
platyceras, *Link & Otto.* Mexico.

Armeria caespitosa, *Boiss.* Spain & Portugal.
juncea, *Girard.* S. France.
latifolia, *Willd.* Portugal.
maritima, *Willd.* Europe.
— var. alba.
plantaginea, *Willd.* Europe.
pungens, *Hoffmgg. & Link.* Portugal, &c.

Arnica montana, *L.* Europe, N. Asia.

Arrhenatherum avenaceum, *Beauv.* Europe.

Artemisia annua, *L.* E. Europe, N. Asia.

Arum italicum, *Mill.* Europe.

Asclepias incarnata, *L.* N. America.
speciosa, *Torr.* N. W. America.

Asparagus officinalis, *L.* Europe, &c.

Asperella hystrix, *Willd.* N. America.

Asperula azurea, *Jaub. & Spach.* Syria.
galioides, *Bieb.* Europe, &c.
tinctoria, *L.* Europe.

Asphodeline liburnica, *Reichb.* S. E. Europe.

Asphodelus albus, *Willd.* S. Europe.
fistulosus, *L.* Mediterranean region.

Aster acuminatus, *Michx.* N. America.
alpinus, *L.* Europe, N. Asia.
Amellus, *L.* Europe, &c.
corymbosus, *Ait.* N. America.
Curtisii, *A. Gray.* N. America.
dahuricus, *Benth.* Siberia.
glaucus, *Torr & Gray.* N. W. America.
Novi-Belgii, *L.* N. America.
puniceus, *L.* N. America.
— var. lucidulus, Gray.
pyrenaeus, *DC.* Pyrenees.
Radula, *Ait.* N. America.
scaber, *Thunb.* Japan.
sibiricus, *L.* Siberia, &c.
spectabilis, *Ait.* N. America.
tanacetifolius, *H. B. & K.* California, &c.
umbellatus, *Mill.* N. America.
— var. latifolius.

Astragalus alpinus, *L.* N. and Arctic regions.
boeticus, *L.* Mediterranean region.
chinensis, *L.* China.
chlorostachys, *Lindl.* Himalaya.
Cicer, *L.* S. Europe.
Crotalariae, *A. Gray.* N. America.
frigidus, *A. Gray.* N. America.
glycyphyllus, *L.* Europe, &c.
kahiricus, *DC.* Orient.
pentaglottis, *L.* Mediterranean region.

Astrantia Biebersteinii, *Fisch. & Mey.* Caucacus.
major, *L.* Europe, &c.
— var. carinthiaca, (Hoppe).

Athamanta cretensis, *L.* S. Europe.

Atriplex Babingtonii, *Woods.* Europe.
hortensis, *L.* N. Asia.
— var. rubra, Hort.
sibirica, *L.* Siberia.

Atropa Belladonna, *L.* Europe, &c.

Aubrietia deltoidea, *DC.* S. Europe.
— var. graeca, (*Griseb.*).
— var. grandiflora.
— var. Leichtlinii, *Hort.*
— var. Richardi, *Hort.*

Aubrietia—*cont.*
erubescens, *Griseb.* Greece.
gracilis, *Sprun.* Greece.

Avena pratensis, *L.* Europe, Siberia.
pubescens, *Huds.* Europe, &c.
sativa, *L.* Cultivated.

Baeria gracilis, *A. Gray.* W. California.
platycarpha, *A. Gray.* California.

Baptisia australis, *R. Br.* N. America.

Barbarea intermedia, *Bor.* Europe.
praecox, *R.Br.* Europe.
vulgaris, *R. Br.* Europe, Temp. Asia.

Basella rubra, *L.* Tropics.

Beckmannia erucaeformis, *Host.* N. hemisphere.
— var. uniflorus, *Scrib.* N. Amer.

Beta trigyna, *Waldst. & Kit.* E. Europe, Asia Minor.
vulgaris, *L.* Europe, Africa, &c.

Bidens cernua, *L.* N. Temperate regions.
frondosa, *L.* N. America.
grandiflora, *Balb.* Mexico.
leucantha, *Willd.* West Indies, &c.
tripartita, *L.* N. Temperate regions.

Biscutella ciliata, *DC.* S. Europe.
didyma, *L.* Mediterranean region.
— var. apula, *L.* Europe.

Blumenbachia insignis, *Schrad.* Monte Video.

Bocconia cordata, *Willd.* China & Japan.
microcarpa, *Maxim.* N. China.

Boltonia asteroides, *L'Herit.* N. America.
incisa, *Benth.* Siberia.

Borago officinalis, *L.* Europe, Asia Minor.

Bouteloua oligostachya, *Torr.* N. America.

Boykinia rotundifolia, *Parry*. California.

Brachycome iberidifolia, *Benth.* Australia.

Brachypodium distachyum, *Beauv.* Europe, &c.
pinnatum, *Beauv.* Europe.
sylvaticum, *R. & S.* Europe, &c.

Brassica campestris, *L.* Old World.
— var. chinensis, (*L.*)
Erucastrum, *L.* Europe.
juncea, *Coss.* Temperate and tropical Asia.
nigra, *Koch.* Old World.
oleracea, *L.* Europe.
Tournefortii, *Gouan.* Mediterranean region.

Briza media, *L.* Europe, &c.
minor, *L.* Europe, &c.

Brodiaea grandiflora, *Sm.* N. W. America.
peduncularis, *S. Wats.* California.
uniflora, *Baker.* Buenos Ayres.

Bromus adoënsis, *Hochst.* Abyssinia.
albidus, *Bieb.* Caucasus.
asper, *Murr.* Europe, &c.
breviaristatus, *Buckl.* N. W. America.
brizaeformis, *Fisch. & Mey.* Caucasus.
ciliatus, *L.* N. America.
erectus, *Huds.* Europe, &c.
inermis, *Leyss.* Europe, &c.
Kalmii, *A. Gray.* N. America.
macrostachys, *Desf.* Mediterranean region.
madritensis, *L.* Europe, &c.
maximus, *Desf.* Europe, &c.
— var. Gussonei (*Parl.*).
mollis, *L.* Europe, &c.
propendens, *Jord.* Europe.
sterilis, *L.* Europe, &c.
Tacna, *Steud.* Peru.
tectorum, *L.* Europe, Asia.
unioloides, *H. B. & K.* South America.

Browallia demissa, *L.* Peru, &c.
elata, *L.* Peru.

Bryonia dioica, *Jacq.* Europe.

Bulbine annua, *Willd.* Cape of Good Hope.

Bulbinella Hookeri, *Benth. & Hook. f.* N. Zealand.

Buphthalmum grandiflorum, *L.* Europe.
salicifolium, *L.* S. Europe.
speciosum, *Schreb.* Europe.

Bupleurum aureum, *Fisch.* E. Europe.
Candollei, *Wall.* Himalaya.
longifolium, *L.* Europe.
rigidum, *L.* W. Europe.
rotundifolium, *L.* Europe, &c.

Butomus umbellatus, *L.* Europe, &c.

Cakile maritima, *Scop.* Europe.

Calamagrostis epigeios, *Roth.* Europe, &c.
varia, *Beauv.* Europe, &c.

Calamintha Acinos, *Clairv.* Europe, &c.
Clinopodium, *Benth.* N. temperate regions.
grandiflora, *Moench.* Europe.
officinalis, *Moench.* Europe.
patavina, *Host.* Europe, &c.

Calandrinia grandiflora, *Lindl.* Chili.
pilosiuscula, *DC.* Chili.
umbellata, *DC.* Chili.

Calceolaria mexicana, *Benth.* Mexico.

Calendula officinalis, *L.* S. Europe.
suffruticosa, *Vahl.* W. Mediterranean region.

Callirhöe pedata, *A. Gray.* N. W. America.

Caltha palustris, *L.* N. hemisphere.
— var. minor, *Syme.*

Camassia Brownii, *Hort.* Origin uncertain.
Cusickii, *S. Wats.* California.
esculenta, *Lindl.* N. W. America.
Fraseri, *Torr.* N. America.
Leichtlinii, *S. Wats.* California.

Camelina sativa, *Crantz.* Europe, &c.

Campanula alliariaefolia, *Willd.* Caucasus, &c.
barbata, *L.* Europe.
bononiensis, *L.* Europe.
carpatica, *Jacq.* E. Europe.
collina, *Bieb.* Caucasus.
drabaefolia, *Sibth. & Sm.* Greece.
— var. alba.
— var. attica (*Boiss. & Heldr.*), Greece.
Erinus, *L.* Mediterranean region.
excisa, *Schleich.* Switzerland.
glomerata, *L.* Europe, &c.
lactiflora, *Bieb.* Caucasus.
latifolia, *L.* Europe, &c.
— var. macrantha, (Fisch.).
— var. versicolor, (*Sibth. & Sm.*).
latiloba, *DC.* Olympus.
Medium, *L.* S. Europe.
persicifolia, *L.* Europe, &c.
— var. alba.
pulla, *L.* Europe.
pyramidalis, *L.* Europe.
ramosissima, *Sibth. & Sm.* Greece.
rapunculoides, *L.* Europe, &c.
reuteriana, *Boiss. & Bal.* Asia Minor, &c.
rhomboidalis, *L.* Europe.
rotundifolia, *L.* N. temperate regions.
Scheuchzeri, *Vill.* Europe.
sibirica, *L.* Europe, Asia.
— var. divergens, (*Willd.*) E. Europe.
spicata, *L.* Europe.
subpyrenaica, *Timb.* Europe.
thyrsoides, *L.* Europe.
Trachelium, *L.* Europe, &c.

Carbenia benedicta, *Adans.* Mediterrean region, &c.

Cardamine graeca, *L.* E. Mediterranean region.
impatiens, *L.* Europe, &c.

Carduus crispus, *L.* Europe, &c.
nutans, *L.* Europe, &c.
orthocephalus, *Wallr.* Europe.
stenolepis, *Benth.* Central Asia.
tenuiflorus, *Curt.* Europe, &c.

Carex adusta, *Boott.* N. America.
arenaria, *L.* N. temperate regions.
Crus-corvi, *Shuttl.* N. America.
depauperata, *Good.* Europe, &c.
divulsa, *Good.* N. temperate regions.
flava, *L.* N. temperate regions.
— var. viridula.
fusca, *All.* Europe, &c.
hirta, *L.* Europe, &c.
hordeistichos, *Vill.* Europe, &c.
leporina, *L.* N. temperate regions.
paniculata, *L.* Temperate regions.
pendula, *Huds.* Europe, &c.
sylvatica, *Huds.* Europe, &c.
teretiuscula, *Good.* Europe, &c.
tribuloides, *Wahlenb.* N. America.
vulpina, *L.* Europe, &c.
vulpinoidea, *Michx.* N. America.

Carthamus flavescens, *Willd.* Asia Minor.
lanatus, *L.* Europe, &c.
tinctorius, *L.* Europe, &c.

Carum Bulbocastanum, *Koch.* Europe, &c.
Carvi, *L.* Europe, &c.
copticum, *Benth. & Hook. f.* Europe, &c.
Petroselinum, *Benth. & Hook. f.* Old World.
rigidulum, *Koch.* Europe.

Catananche caerulea, *L.* W. Mediterranean region.

Caucalis daucoides, *L.* Europe, &c.

Cedronella mexicana, *Benth.* Mexico.
cana, *Hook.* Arizona.

Celsia glandulosa, *Bouché.* Asia Minor.
orientalis, *L.* Asia Minor.
pontica, *Boiss.* Asia Minor.

Cenchrus tribuloides, *L.* N. America.

Cenia turbinata, *Pers.* Cape of Good Hope.

Centaurea alba, *L.* var. deusta, *Ten.* S. Europe.
atropurpurea, *Waldst. & Kit.* E. Europe.
axillaris, *Willd.* Europe, &c.
Crocodylium, *L.* Syria.
Cyanus, *L.* Europe, &c.
cynaroides, *Link.* Canary Islands.
dealbata, *Willd.* Asia Minor, &c.
diluta, *Dryand.* N. Africa.
Fontanesii, *Spach.* Algeria.
glastifolia, *L.* Asia Minor, &c.
Jacea, *L.* Europe, &c.
melitensis, *L.* Europe.
nigra, *L.* Europe.
nigrescens, *Willd.* Europe.
— var. vochinensis (*Bernh.*).
pulchra, *DC.* India.
Scabiosa, *L.* Europe.
— var. olivieriana, (*DC.*).

Centranthus Calcitrapa, *Dufr.* Europe.
macrosiphon, *Boiss.* Spain.
ruber, *DC.* Europe, &c.

Cephalaria alpina, *Schrad.* Europe.
leucantha, *Schrad.* Spain, &c.
syriaca, *Schrad.* Mediterranean region.
tatarica, *Schrad.* Siberia.
transsylvanica, *L.* South Europe, Asia Minor, &c.

Cerastium alpinum, *L.* var. villosum, (*Baumg.*) Europe.
arvense, *L.* Europe.
— var. grandiflorum.
chloraefolium, *Fisch. & Mey.* Asia Minor.
perfoliatum, *L.* Mediterranean region.
purpurascens, *Adams.* Asia Minor, &c.

Cerinthe alpina, *Kit.* Europe, &c.
major, *L.* Europe.

Chaerophyllum aromaticum, *L.* Europe.
aureum, *L.* Europe, Asia Minor.

Charieis heterophylla, *Cass.* Cape of Good Hope.

Cheiranthus Cheiri, *L.* Europe.

Chelidonium majus, *L.* Europe, &c.
— var. flore pleno.
— var. laciniatum.

Chelone Lyoni, *Pursh.* N. America.
nemorosa, *Dougl.* N. America.
obliqua, *L.* N. America.

Chenopodium album, *L.* Temperate and tropical regions.
ambrosoides, *L.* Temperate and tropical regions.
aromaticum, *Hort.* Origin uncertain.
Bonus-Henricus, *L.* Europe.
Botrys, *L.* Europe, &c.
capitatum, *Aschers.* Europe, &c.
ficifolium, *Sm.* Europe.
graveolens, *Willd.* Mexico.
opulifolium, *Schrad.* Europe, &c.
Quinoa, *Willd.* S. America.
virgatum, *Thumb.* Japan.
Vulvaria, *L.* Europe, &c.

Chlorogalum pomeridianum, *Kunth.* California.

Chorizanthe membranacea, *Benth.* N. America.

Chorispora tenella, *DC.* Caucasus, &c.

Chrysanthemum carinatum, *Schousb.* N. Africa.
— var. atrococcineum.
carneum, *Steud.* Caucasus.
caucasicum, *Pers.* Caucasus.
cinerariaefolium, *Vis.* Dalmatia.
coccineum, *Willd.* Caucasus, &c.
coronarium, *L.* Mediterranean region.
corymbosum, *L.* Mediterranean region.
lacustre, *Brot.* S. W. Europe.
Leucanthemum, *L.* Europe, &c.
maximum, *Ramond.* Pyrenees.
macrophyllum, *Waldst. & Kit.* Hungary.
multicaule, *Desf.* N. Africa.
pallens, *J Gay.* Europe.
Parthenium, *Bernh.* Europe.
praealtum, *Vent.* Caucasus, &c.
segetum, *L.* Europe, &c.

Chrysanthemum—*cont.*
setabense, *Dufour.* Spain & Portugal.
Zawadskii, *Herbich.* E. Europe.

Chrysopogon Gryllus, *Trin.* Tropical and sub-tropical regions.

Chrysopsis villosa, *DC.* N. America.

Cicer arietinum, *L.* Europe, &c.

Cichorium Endivia, *L.* Orient.
Intybus, *L.* Europe.
pumilum, *Jacq.* Mediterranean region.

Cimicifuga foetida, *L.* Europe, &c.
— var. intermedia.
racemosa, *Nutt.* N. America.

Citrullus vulgaris, *Schrad.* Tropical Africa.

Cladium germanicum, *Schrad.* Temperate & subtropical regions.

Clarkia elegans, *Dougl.* California.
pulchella, *Pursh.* Oregon, &c.
— var. alba.

Claytonia perfoliata, *Donn.* N. America.
sibirica, *L.* N. Asia and N. America.

Clematis integrifolia, *L.* S. Europe, &c.
recta, *L.* S. Europe.

Cleome integrifolia, *Torr. & Gray.* N. America.
violacea, *L.* Europe, &c.

Cleonia lusitanica, *L.* Spain, &c.

Clypeola cyclodontea, *Delile.* Europe.

Cnicus altissimus, *Willd.* N. America.
canus, *Roth.* Europe.
ciliatus, *Roth.* Europe.
fimbriatus, *Bieb.* Caucasus.
horridus, *Bieb.* Caucasus.
intermedius, *Heller.* Europe.
ligularis, *Hort. Kew.* Orient.
monspessulanus, *L.* S. Europe.
ochroleucus, *Spreng.* Europe.
oleraceus, *L.* Europe.

Cnicus—*cont.*
serrulatus, *Bieb.* Europe, Caucasus.
stellatus, *Roth.* Europe.
yriacus, *Roth.* Mediterranean region.

Cochlearia danica, *L.* N. & Arctic regions.
glastifolia, *L.* S. Europe.
officinalis, *L.* N. & Arctic regions.

Codonopsis ovata, *Benth.* W. Himalaya.

Colchicum speciosum, *Stev.* Caucasus.

Collinsia bartsiaefolia, *Benth.* California.
bicolor, *Benth.* California.
grandiflora, *Dougl.* N. W. America.
parviflora, *Lindl.* N. America.
sparsiflora, *Fisch. & Mey.* N. America.
verna, *Nutt.* N. America.

Collomia coccinea, *Lehm.* Chili.
gilioides, *Benth.* California.
grandiflora, *Dougl.* California.
linearis, *Nutt.* California, &c.

Commelinacoelestis, *Willd.* Mexico.

Conium maculatum, *L.* Europe.

Conringia orientalis, *Dum.* Europe, &c.

Convallaria majalis, *L.* N. temperate regions.

Convolvulus tricolor, *L.* Mediterranean region.
undulatus, *Cav.* Mediterranean region.

Coreopsis abyssinica, *Sch. Bip.* Abyssinia.
Drummondi, *Torr. & Gray.* Texas.
grandiflora, *Nutt.* S. United States.
lanceolata, *L.* N. America.
— var. villosa. *Michx.* S. United States.
tinctoria, *Nutt.* N. America.
— var. atrosanguinea.

Coriandrum sativum, *L.* Europe, &c.

Corispermum hyssopifolium, *L.* N. hemisphere.

Coronilla atlantica, *Boiss. & Reut.* Marocco.
vaginalis, *Lam.* Europe, &c.
varia, *L.* Europe, &c.

Corrigiola littoralis, *L.* Europe.

Cortusa Matthioli, *L.* Europe & N. Asia.

Corydalis capnoides, *Wahlenb.* Europe.
glauca, *Pursh.* N. America.
lutea, *DC.* Europe.
racemosa, *Pers.* Japan.
sibirica, *Pers.* Siberia.

Corynephorus canescens, *Beauv.* Europe.

Cosmidium burridgeanum, *Hort.* Garden origin.

Cosmos bipinnatus, *Cav.* Mexico, &c.

Cotula coronopifolia, *L.* S. Africa.

Cousinia uncinata, *Regel.* N. Asia.

Crambe pinnatifida, *R. Br.* Caucacus.

Crepis alpina, *L.* Asia Minor, &c.
aurea, *Reichb.* Europe.
hyoseridifolia, *Reichb.* Europe.
paludosa, *Moench.* Europe.
rubra, *L.* S. Europe, &c.
setosa, *Hall. f.* Europe, &c.
sibirica, *L.* Asia, &c.
tectorum, *L.* Europe, &c.
virens, *L.* Europe, &c.

Crocus biflorus, *Mill.* Tuscany, &c.
cancellatus, *Herb.* var. cilicicus, *Maw.* Asia Minor.
etruscus, *Parl.* Tuscany.
Imperati, *Tenore.* Southern Italy.
medius, *Balb.* N. Italy.
Sieberi, *Gay.* Greece, &c.
speciosus, *Bieb.* Asia Minor.
tommasinianus, *Herb.* Dalmatia, &c.
vernus, *All.* Europe.
zonatus, *Gay.* Asia Minor.

Crucianella aegyptiaca, *L.* Egypt.

Cryptostemma calendulaceum, *R.Br.* S. Africa.

Cucubalus bacciferus, *L.* Europe, &c.

Cuminum Cyminum, *L.* Mediterranean region.

Cuphea lanceolata, *Ait.* Mexico.
pinetorum, *Benth.* Mexico.
Zimapani, *Morr.* Mexico.

Cuscuta Epilinum, *Weihe.* Europe, &c.

Cyclanthera explodens, *Naud.* Columbia.

Cynara Scolymus, *L.* Europe, &c.

Cynodon Dactylon, *Pers.* Cosmopolitan.

Cynoglossum officinale, *L.* Europe, &c.
petiolatum, *A. DC.* Himalaya.
pictum, *Ait.* Mediterranean region.

Cynosurus cristatus, *L.* Europe, &c.
echinatus, *L.* S. Europe, &c.

Dactylis glomerata, *L.* Europe, &c.

Dahlia scapigera, *Knowles & Westcott.* Mexico.
variabilis, *Desf.* Mexico.

Dalea Lagopus, *Willd.* Mexico.

Datura inermis, *Jacq.* Abyssinia.
Stramonium, *L.* Cosmopolitan.
Tatula, *L.* Europe, &c.
— var. gigantea.

Daucus Carota, *L.* Europe, &c.
pusillus, *Michx.* N. America.

Delphinium Ajacis, *Reichb.* Europe.
cardinale, *Hook.* California.
cardiopetalum, *DC.* Europe.
cashmirianum, *Royle.* Himalaya.
caucasicum, *C. A. Mey.* Caucasus.
Consolida, *L.* Europe, &c.
corymbosum, *Regel.* Turkestan.
dictyocarpum, *DC.* Siberia.
elatum, *L.* Europe, &c.
— var. alpinum, (*Waldst. & Kit.*)
— var. intermedium.
formosum, *Boiss. & Huet.* Armenia.

Delphinium—*cont.*
grandiflorum, *L.* Siberia.
hybridum, *Steph.* Europe & Orient.
maackianum, *Regel.* Amurland.
orientale, *J. Gay.* Europe, Orient.
speciosum, *Bieb.* Caucasus.
— var. turkestanicum.
triste, *Fisch.* Siberia.
vestitum, *Wall.* Himalaya.

Demázeria sicula, *Dum.* Europe.

Deschampsia caespitosa, *Beauv.* Temperate regions.

Deyeuxia neglecta, *Kunth.* N. temperate regions.

Dianthus arenarius, *L.* Europe.
atrorubens, *All.* S. Europe.
barbatus, *L.* Europe.
caesius, *Sm.* Europe.
callizonus, *Schott & Kotschy.* Transylvania.
carthusianorum, *L.* Europe, &c.
Caryophyllus, *L.* Europe, &c.
ciliatus, *Guss.* Italy, &c.
deltoides, *L.* Europe, &c.
fragrans, *Bieb.* Caucasus.
furcatus, *Balb.* Piedmont.
giganteus, *Urv.* E. Europe.
hirtus, *Vill.* France.
monspessulanus, *L.* S. Europe.
petraeus, *Waldst. & Kit.* E. Europe.
plumarius, *L.* Europe, &c.
Requienii, *Gren. & Godr.* Pyrenees.
tener, *Balb.* Piedmont.

Dictamnus albus, *L.* Europe, &c.
— var. purpureus.

Digitalis ambigua, *Murr.* Europe, &c.
ferruginea, *L.* Europe.
lanata, *Ehrh.* E. Europe.
lutea, *L.* Europe.
media, *Roth.* S. Europe.
purpurea, *L.* Europe.

Dimorphotheca annua, *Less.* Cape of Good Hope.
hybrida, *DC.* Cape of Good Hope.

Dipcadi serotinum, *Medic.* Europe, &c.

Diplotaxis siifolia, *Kunze.* Spain, &c.
tenuifolia, *DC.* Europe, &c.

Dipsacus asper, *Wall.* Himalaya.
fullonum, *L.* Europe, &c.
laciniatus, *L.* Europe, &c.
sylvestris, *Mill.* Europe, &c.

Dischisma arenarium, *E. Mey.* Cape of Good Hope.

Dodecatheon Meadia, *L.* var. splendidum.

Doronicum plantagineum, *L.* var. excelsum.

Dorycnium herbaceum, *Vill.* S. Europe, Asia Minor.

Draba aizoides, *L.* Europe.
arabisans, *Michx.* N. America.
carinthiaca, *Hoppe.* Europe.
frigida, *Saut.* Alps, Europe.
hirta, *L.* N. & Arctic regions.
incana, *L.* N. arctic regions.
— var. Thomasii, (*Koch*).
Kotschyi, *Stur.* E. Europe.
lactea, *Adams.* Europe.
Loiseleurii, *Boiss.* Corsica.
stellata, *Jacq.* N. and arctic regions.

Dracocephalum grandiflorum, *L.* Siberia.
Moldavica, *L.* Siberia, &c.
nutans, *L.* Siberia.
parviflorum, *Nutt.* N. America.
ruyschiana, *L.* Europe, &c.

Drimia robusta, *Baker.* S. Africa.

Dryas octopetala, *L.* Europe, &c.

Drypis spinosa, *L.* Mediterranean region.

Dulichium spathaceum, *Rich.* N. America.

Ecballium Elaterium, *A. Rich.* Mediterranean region.

Eccremocarpus scaber, *Ruiz & Pav.* Chili.

Echinaria capitata, *Desf.* Europe.

Echinocystis lobata, *Torr & Gray.* N. America.

Echinodorus ranunculoides, *Engelm.* Europe, &c.

Echinops bannaticus, *Rochel.* E. Europe.
globifer, *Janka.* E. Europe.
Ritro, *L.* Mediterranean region.
sphaerocephalus, *L.* Europe, &c.

Echium plantagineum, *L.* Europe, &c.

Eleusine coracana, *Gaertn.* S. America, &c.

Elsholtzia cristata, *Willd.* Europe, N. Asia.

Elymus canadensis, *L.* N. America.
— var. glaucifolius, *A. Gray.*
sibiricus, *L.* Siberia.
virginicus, *L.* N. America.

Emex spinosa, *Campd.* S. Europe, &c.

Emilia flammea, *Cass.* India, &c.

Encelia subaristata, *A. Gray.* Mexico.

Epilobium angustifolium, *L.* N. hemisphere.
billardierianum, *Ser.* Australia.
Dodonaei, *Vill.* Europe.
hirsutum, *L.* Europe.
Lamyi, *Schultz.* S. Europe, &c.
linnaeoides, *Hook. f.* N. Zealand, &c.
montanum, *L.* Europe.
nummularifolium, *A. Cunn.* N. Zealand.
— var. longipes.
roseum, *Schreb.* Europe, &c.
rosmarinifolium, *Haenke.* Europe.
— var. sericeum.
trigonum, *Schrank.* Europe.

Eragrostis abyssinica, *Link.* Abyssinia.
minor, *Host.* Tropics.
Purshii, *Schrad.* N. America.

Eremostachys laciniata, *Bunge.* Asia Minor, &c.

Eremurus altaicus, *Stev.* Siberia, &c.
spectabilis, *Bieb.* Asia Minor, &c.

Erianthus fastigiatus, *Nees.* India.
strictus, *Baldw.* N. America.

Erigeron acre, *L.* var. angustatus, (*Fries*). N. temp. regions.
compositus, *Pursh.* N. America, &c.
droebachensis, *O. Muell.* Europe.
glabellus, *Nutt.* N. America.
— var. asper.
Howellii, *A. Gray.* N. W. America.
macranthus, *Nutt.* N. W. America.
mucronatus, *DC.* Mexico.
philadelphicus, *L.* N. America.
speciosus, *DC.* N.W. America.
strigosus, *Muhl.* N. America.

Erinus alpinus, *L.* Europe.

Eriophyllum caespitosum, *Dougl.* N.W. America.

Erodium gruinum, *Soland.* S. Europe, &c.
macradenum, *L'Herit.* Pyrenees.
malacoides, *Willd.* Mediterranean region.
serotinum, *Stev.* Caucasus.
trichomanefolium, *L'Herit.* Spain.
tmoleum, *Reut.* Asia Minor.

Eruca sativa, *Mill.* Mediterranean region.

Eryngium amethystinum, *L.* Europe.
bromeliæfolium, *Delar.* Central America.
giganteum, *Bieb.* Armenia.
planum, *L.* Europe, &c.
triquetrum, *Vahl.* N. Africa.

Erysimum asperum, *DC.* N. America.
aureum, *Bieb.* Caucasus.
boryanum, *Boiss.* Greece, &c.
hieracifolium, *L.* Europe.
marshallianum, *Andrz.* Siberia, &c.
perowskianum, *Fisch. & Mey.* Caucasus.
rupestre, *DC.* Asia Minor.

Erythraea Centaurium, *Pers.* Europe.

Eschscholzia californica, *Cham.* California.
— var. caespitosa, *Brewer.*

Eucharidium Breweri, *A. Gray.* California.
concinnum, *Fisch. & Mey.* California.
— var. grandiflorum.

Eupatorium ageratoides, *L.* N. America.
aromaticum, *L.* N. America.
cannabinum, *L.* Europe, &c.
purpureum, *L.* N. America.
serotinum, *Michx.* N. America.
sessilifolium, *L.* N. America.

Euphorbia coralloides, *L.* S. Europe.
dentata, *Michx.* N. America.
exigua, *L.* Europe.
flavicoma, *DC.* Spain, &c.
hierosolymitana, *Boiss.* Syria.
medicaginea, *Boiss.* Spain.
Myrsinites, *L.* S. Europe.
Peplis, *L.* Europe, &c.
platyphyllos, *L.* Europe, &c.
Preslii, *Guss.* N. America.
segetalis, *L.* Europe.
stricta, *L.* Europe.
virgata, *Waldst. & Kit.* E. Europe.

Fagopyrum esculentum, *Moench.* Europe, &c.
tataricum, *Gaertn.* Europe, &c.

Farsetia clypeata, *R. Br.* S. Europe, &c.

Fedia Cornucopiae, *Gaertn.* Mediterranean region.

Felicia fragilis, *Cass.* S. Africa.

Ferula communis, *L.* Mediterranean region.
Ferulago, *L.* S. Europe, &c.
glauca, *L.* S. Europe.
— var. candelabra, *Heldr.*
Linki, *Webb. & Berth.* Canary Islands.
tingitana, *L.* N. Africa, &c.

Festuca arundinacea, *Vill.* Europe.
bromoides, *L.* Temperate regions.
capillifolia, *Dufour.* Spain.

Festuca—*cont.*
delicatula, *Lag.* Spain and Portugal.
duriuscula, *L.* Europe, &c.
— var. crassifolia, *Gaud.*
elatior, *L.* Europe, &c.
— var. pratensis, (*Huds.*)
gigantea, *Vill.* Europe, &c.
Halleri, *All.* S. Europe.
heterophylla, *Lam.* Europe.
montana, *Steud.* var. altissima, (*Boiss.*) Spain.
Myuros, *L.* Europe, &c.
pančičiana, *Hack.* Europe.
Poa, *Kunth.* S. Europe.
rigida, *Kunth.* S. Europe.
sciuroides, *Roth.* Europe.
scoparia, *Kern.* Pyrenees.

Foeniculum vulgare, *Mill.* Europe.

Fragaria indica, *Andr.* India, China, &c.

Francoa appendiculata, *Cav.* Chili.

Fritillaria armena, *Boiss.* Asia Minor.
imperialis, *L.* Orient.
kotschyana, *Herb.* Asia Minor.
Meleagris, *L.* Europe, &c.
pontica, *Wahl.* Asia Minor.

Fumaria officinalis, *L.* Temperate regions of Old World.

Funkia lancifolia, *Spreng.* Japan.
— var. albo-marginata, *Hort.*
ovata, *Spreng.* Japan.
sieboldiana, *Hook.* Japan.

Gaillardia aristata, *Pursh.* N. America.

Galega officinalis, *L.* Europe, &c.
orientalis, *Lam.* Caucasus.

Galeopsis pyrenaica. *Bartl.* Pyrenees.

Galinsoga brachystephana, *Regel.* S. America.
parviflora, *Cav.* S. America.

Galium boreale, *L.* N. temperate regions.
Mollugo, *L.* Europe, &c.
recurvum, *Req.* Greece, &c.
tenuissimum, *Bieb.* Caucasus.
tricorne, *Stokes.* Europe, &c.
verum, *L.* Europe, &c.

Gaudinia fragilis, *Beauv.* Mediterranean region.

Gaura parviflora, *Dougl.* N. America.

Gentiana asclepiadea, *L.* Europe.
— var. alba.
cruciata, *L.* Europe, &c.
lutea, *L.* Europe, &c.
septemfida, *Pall.* Caucasus.
tibetica, *King.* Himalaya, &c.

Geranium albanum, *Bieb.* Caucasus.
armenum, *Boiss.* Orient.
bohemicum, *L.* Europe.
Endressi, *Gay.* Pyrenees.
eriostemon, *Fisch.* Siberia.
Londesii, *Fisch.* Siberia.
maculatum, *L.* N. America.
nodosum, *L.* Europe.
palustre, *L.* Europe, &c.
pratense, *L.* Europe, &c.
pusillum, *Burm. f.* Europe, &c.
pyrenaicum, *Burm. f.* Europe, &c.
rivulare, *Vill.* Europe.
sylvaticum, *L.* Europe, &c.
wallichianum, *G. Don.* Himalaya.
Wilfordi, *Maxim.* Manchuria.
wlassovianum, *Fisch.* Siberia.

Gerbera Bellidiastrum, *Benth.* China, &c.
kunzeana, *A. Br. & Asch.* Himalaya.
nivea, *Sch. Bip.* Himalaya.

Geum chiloense, *Balb.* Chili.
hispidum, *Fries.* Spain.
inclinatum, *Schleich.* Switzerland.
macrophyllum, *Willd.* N. W. America.
molle, *Vis.* Servia.
montanum, *L.* Europe.
parviflorum, *Sm.* Antartic regions.
pyrenaicum, *Mill.* Pyrenees.
rivale, *L.* N. temperate regions.
strictum, *Ait.* N. temperate regions.
triflorum, *Pursh.* N. America.
tyrolense, *Kern.* Tyrol.
urbanum, *L.* Europe, &c.

Gilia achilleaefolia, *Benth.* California.
androsacea, *Steud.* California.
— var. rosea.
capitata, *Sims.* N.W. America.
densiflora, *Benth.* California.
dianthoides, *Endl.* California.
inconspicua, *Dougl.* California.
laciniata, *Ruiz & Pav.* Chili, Peru.
micrantha, *Steud.* California.
squarrosa, *Hook. & Arn* California.
tricolor, *Benth.* California.

Gillenia trifoliata, *Moench.* N. America.

Gladiolus atroviolaceus, *Boiss.* Syria, &c.
segetum, *Ker-Gawl.* Mediterranean region.

Glaucium corniculatum, *Curt.* Europe, &c.
— var. rubrum, *Hort.*
flavum, *Crantz.* var. fulvum, Sm.

Globularia trichosantha, *Fisch. & Mey.* Asia Minor, &c.
vulgaris, *L.* Europe, &c.

Glyceria maritima, *Mert. & Koch.* N. temperate regions.

Glycine Soja, *Sieb. & Zucc.* Tropical Asia.

Gnaphalium indicum, *L.* Tropics of Old World.
luteo-album, *L.* Cosmopolitan.

Gratiola officinalis, *L.* Europe.
— var. minor.

Grindelia glutinosa, *Dunal.* California.
inuloides, *Willd.* Texas, &c.
squarrosa, *Dunal.* N. W. America.

Guizotia abyssinica, *Cass.* Tropical Africa.

Gunnera chilensis, *Lam.* Chili.
manicata, *Linden.* Brazil.

Gypsophila muralis, *L.* Europe.
paniculata, *L.* Siberia, &c.
Rokejeka, *Delile.* Egypt, &c.

Hablitzia tamnoides, *Bieb.* Caucasus.

Hastingia alba, *S. Wats.* California.

Hebenstreitia tenuifolia, *Schrad.* Cape of Good Hope.

Hedysarum boreale, *Nutt.* N. America.
coronarium, *L.* S. W. Europe.
esculentum, *Ledeb.* E. Siberia.
flexuosum, *L.* Spain.
microcalyx, *Baker.* Himalaya.
neglectum, *Ledeb.* Siberia.
obscurum, *L.* Europe.
Sibthorpii, *Nym.* Mediterranean region.

Helenium autumnale, *L.* var pumilum, (*Willd.*) N. America.
Bolanderi, *A. Gray.* California.
Hoopesii, *A. Gray.* N. W. America.
tenuifolium, *Nutt.* N. America.

Helianthus annuus, *L.* N. America.
debilis, *Nutt.* Texas, &c.

Helichrysum bracteatum, *Andr.* Australia.
lanatum, *DC.* Asia Minor.
serotinum, *Boiss.* S. W. Europe.

Heliophila amplexicaulis, *L. f.* Cape of Good Hope.
araboides, *Sims.* Cape of Good Hope.
crithmifolia, *Willd.* Cape of Good Hope.

Heliopsis laevis, *Pers.* N. America.

Heliotropium europaeum, *L.* Europe.

Helipterum Manglesii, *F. Muell.* Australia.
Milleri, *Hort.* Australia.
roseum, *Benth.* Australia.

Helleborus colchicus, *Regel.* Mingrelia.
foetidus, *L.* Europe.
orientalis, *Lam.* Greece, &c.
— var. roseus.

Helonias bullata, *L.* N. America.
— var. latifolia.

Hemerocallis flava, *L.* S. Europe.
fulva, *L.* S. Europe, &c.
— var. Kwanso, *Regel.*

Heracleum asperum, *Bieb.* Caucasus.
gummiferum, *Willd.* Europe.
lanatum, *Michx.* N. America.
Panaces, *L.* S. Europe.
pyrenaicum, *Lam.* Pyrenees.
Sphondylium, *L.* Europe.
villosum, *Fisch.* Caucasus.

Herniaria glabra, *L.* Europe, N. Asia.
hirsuta, *L.* Europe.

Hesperis matronalis, *L.* Europe, &c.

Heterotheca Lamarckii, *Cass.* N. America.

Heuchera cylindrica, *Dougl.* N. W. America.
Drummondi, *Hort.* Origin uncertain.
glabra, *Willd.* N. W. America.
pilosissima, *Fisch. & Mey.* N. America.
sanguinea, *Engelm.* New Mexico.

Hibiscus Trionum, *L.* Tropics of Old World.

Hieracium alpinum, *L.* Europe.
amplexicaule, *L.* S. Europe.
aurantiacum, *L.* Europe.
bupleuroides, *C. C. Gmel.* Europe.
corymbosum, *Fries.* N. Europe.
Jankae, *Uechtritz.* E. Europe.
lanatum, *Waldst. & Kit.* Europe.
murorum, *L.* var. integrifolium, (*Lange*).
nigrescens, *Willd.* E. Europe.
onosmoides, *Fries.* Norway.
pallidum, *Biv.* Norway.
pratense, *Tausch.* Europe, &c.
pulmonarioides, *Vill.* Europe.
rigidum, *Hartm.* Europe.
saxatile, *Vill.* Europe.
stoloniflorum, *Waldst. & Kit.* Europe.
villosum, *Jacq.* Europe.
vulgatum, *Fries.* N. temperate regions.

Hippocrepis multisiliquosa, *L.* Mediterranean region.

Holcus lanatus, *L.* Europe.

Hordeum jubatum, *L.* N. America, &c.
maritimum, *With.* Europe, &c.
murinum, *L.* Europe, &c.
secalinum, *Schreb.* Europe, &c.

Horminum pyrenaicum, *L.* Pyrenees.

Hosackia subpinnata, *G. Don.* N. America.

Humulus japonicus, *Sieb. & Zucc.* Japan.
var. variegatus.

Hunnemannia fumariaefolia, *Sweet.* California.

Hyacinthus amethystinus, *L.* Pyrenees.
romanus, *L.* Mediterranean region, &c.

Hydrocotyle repanda, *Pers.* N. America.

Hydrophyllum canadense, *L.* N. America.
virginicum, *L.* N. America.

Hymenophysa pubescens, *C. A. Mey.* Siberia.

Hyoscyamus aureus, *L.* Asia Minor, &c.
niger, *L.* Europe, &c.
— var. albus, *Hort.*

Hypecoum grandiflorum, *Benth.* Mediterranean region.
procumbens, *L.* Mediterranean region, &c.

Hypericum atomarium, *Boiss.* Asia Minor, &c.
Gebleri, *C. A. Mey.* Siberia.
montanum, *L.* Europe.
olympicum, *L.* Asia Minor, &c.
orientale, *L.* var. decussatum, (Kunze).
perforatum, *L.* Europe, &c.
pyramidatum, *Ait.* N. America.
Richeri, *Vill.* Europe.
tetrapterum, *Fries.* Europe, &c.
tomentosum, *L.* Mediterranean region.

Hypochoeris glabra, *L.* Europe.

Hyssopus officinalis, *L.* Europe, &c.
— var. aristatum, (*Jord.*).

Iberis amara, *L.* Europe.
ciliata, *All.* Italy, &c.
lagascana, *DC.* Spain.
pectinata, *Boiss.* Spain.
umbellata, *L.* S. Europe.
— var. carnea.

Impatiens amphorata, *Edgw.* Himalaya.
balsamina, *L.* India & Orient.
parviflora, *DC.* Siberia, &c.
Roylei, *Walp.* Himalaya.
scabrida, *DC.* Himalaya.

Inula barbata, *Wall.* Himalaya.
bifrons, *L.* S. Europe.
ensifolia, *L.* S. Europe, &c.
glandulosa, *Puschk.* Caucasus.
grandiflora, *Willd.* Himalaya, &c.
Helenium, *L.* Europe, &c.
hirta, *L.* Europe, &c.
Hookeri, *C. B. Clarke.* Himalaya.
salicina, *L.* Europe, &c.
thapsoides, *Spreng.* Caucasus.

Iris foetidissima, *L.* Europe, &c.
graminea, *L.* S. Europe, &c.
missouriensis, *Nutt.* N. America.
Pseudacorus, *L.* Europe, &c.
setosa, *Pall.* E. Siberia.
— var. atropurpurea.
sibirica, *L.* Europe, &c.
spuria, *L.* Mediterranean region, &c.
— var. notha (*Bieb.*).

Isatis tinctoria, *L.* Europe, &c.

Isopyrum fumarioides, *L.* Europe, &c.

Iva xanthifolia, *Nutt.* N. America.

Jasonia tuberosa, *L.* S. Europe.

Juncus alpinus, *Vill.* Europe, &c.
balticus, *Willd.* Europe, &c.
bufonius, *L.* N. temperate regions.
Chamissonis, *Kunth.* Andes.
compressus, *Jacq.* Temperate regions.

Juncus—*cont.*
effusus, *L.* Europe, &c.
glaucus, *Sibth.* Europe, &c.
lamprocarpus, *Ehrh.* Europe, &c.
maritimus, *Lam.* Temperate regions.
obusiflorus, *Ehrh.* Europe, &c.
squarrosus, *L.* Europe.
tenuis, *Willd.* Europe, &c.

Jurinea cyanoides, *D.C.* Caucasus, &c.

Kitaibelia vitifolia, *Willd.* E. Europe.

Kochia scoparia, *Schrad.* Europe, &c.

Koeleria cristata, *Pers.* N temperate regions.
phleoides, *Pers.* Mediterranean region.

Lactuca hirsuta, *Muhl.* N. America.
muralis, *E. Mey.* Europe, &c.
Plumieri, *Gren. & Godr.* France.
virosa, *L.* Europe, &c.

Lallemantia peltata, *Fisch. & Mey.* Caucasus.

Lamarckia aurea, *Moench.* Mediterranean region.

Lapsana communis, *L.* Europe.

Lasthenia glabrata, *Lindl.* California.

Lathyrus angulatus, *L.* Europe.
Aphaca, *L.* Europe, &c.
articulatus, *L.* W. Mediterranean region.
Cicera, *L.* Mediterranean region.
Clymenum, *L.* Mediterranean region.
filiformis, *Gay.* S. Europe.
latifolius, *L.* Europe.
— var. ensifolius (*Badaro*).
macrorrhizus, *Wimm.* Europe.
montanus, *Bernh.* Europe.
niger, *Bernh.* Europe, &c.
Nissolia, *L.* Europe, &c.
Ochrus, *DC.* Mediterranean region.
pannonicus, *Garcke.* var. varius. Europe.

Lathyrus—*cont.*
pisiformis, *L.* Europe, &c.
rotundifolius, *Willd.* Orient.
sativus, *L.* Europe, &c.
sphaericus, *Retz.* S. Europe.
sylvestris, *L.* Europe.
tingitanus, *L.* W. Mediterranean region.
tuberosus, *L.* Europe, &c.
venosus, *Muhl.* N. America.

Lavatera cachemiriana, *Cambess.* Himalaya.
thuringiaca, *L.* S. Europe.
trimestris, *L.* Mediterranean region.

Layia elegans, *Torr. & Gray.* California.
glandulosa, *Hook. & Arn.* California.

Lens esculenta, *Moench.* Orient.

Leontodon autumnalis, *L.* Europe, &c.
crispus, *Vill.* Europe.
Ehrenbergii, *Hort. Kew.* Origin uncertain.

Leontopodium alpinum, *Cass.* Europe, &c.

Leonurus Cardiaca, *L.* Europe, &c.
sibiricus, *L.* Siberia, &c.
tataricus, *L.* Central Asia.

Lepachys columnaris, *Torr. & Gray.* N. W. America.
var. pulcherrima, *Torr. & Gray.*

Lepidium Draba, *L.* Europe, &c.
graminifolium, *L.* Europe, &c.
incisum, *Roth.* Siberia, &c.
latifolium, *L.* Europe, &c.
Menziesii, *DC.* N. America.
sativum, *L.* Orient.
virginicum, *L.* N. America.

Leptosyne Douglasii, *DC.* California.
maritima, *A. Gray.* California.

Lepturus cylindricus, *Trin.* Europe, &c.

Leuzea conifera, *DC.* Mediterranean region.

Levisticum officinale, *Koch.* var. variegatum, Europe.

Liatris scariosa, *Willd.* N. America.
spicata, *Willd.* N. America.
— var. montana, *A. Gray.*

Ligusticum alatum, *Spreng.* Caucasus.
pyrenaicum, *Gouan.* Pyrenees.
scoticum, *L.* Europe, &c.
Seguieri, *Koch.* S. Europe.
Thomsoni, *C. B. Clarke.* Himalaya.

Linaria alpina. *Mill.* Europe.
anticaria, *Boiss. & Reut.* Spain.
bipartita, *Willd.* N. Africa.
Broussonetii, *Char.* Marocco, &c.
chalepensis, *Mill.* S. Europe, &c.
dalmatica, *Mill.* Dalmatia.
hirta, *Moench.* Spain and Portugal.
maroccana, *Hook. f.* Marocco.
minor, *Desf.* Europe, &c.
multipunctata, *Hoffmgg. & Link.* Portugal.
peloponnesiaca, *Boiss. & Heldr.* Greece.
purpurea, *L.* Europe.
reticulata, *Desf.* N. Africa, &c.
— var. purpurea.
saxatilis, *Hoffmgg. & Link.* Portugal.
spartea, *Hoffmgg. & Link.* W. Mediterranean region.
triornithophora, *Willd.* Portugal.
triphylla, *Mill.* Mediterranean region.
tristis, *Mill.* Spain.
vulgaris, *Mill.* Europe, &c.

Lindelophia spectabilis, *Lehm.* Himalaya.

Lindheimera texana, *A. Gray.* Texas.

Linum alpinum, *L.* Europe, &c.
angustifolium, *Huds.* Europe, &c.
grandiflorum, *Desf.* Algeria.
— var. coccineum.
nervosum, *Waldst. & Kit.* Hungary.
perenne, *L.* N. temperate regions.
usitatissimum, *L.* Europe, &c.

Loasa muralis, *Griseb.* Chili.
vulcanica, *André.* New Grenada.

Lobelia Erinus, *L.* S. Africa.
syphilitica, *L.* N. America.
tenuior, *R. Br.* Australia.
triquetra, *L.* S. Africa.

Lolium multiflorum, *Lam.* Europe.

Lonas inodora, *Gaertn.* Sicily, &c.

Lopezia coronata, *Andr.* Mexico.

Lotus corniculatus, *L.* Temperate regions.
major, *Scop.* Europe.
ornithopodioides, *L.* Mediterranean region.
siliquosus, *L.* Mediterranean region.
tenuis, *Waldst. & Kit.* Europe, &c.
Tetragonolobus, *L.* Mediterranean region.

Lunaria annua, *L.* Europe.
rediviva, *L.* Europe.

Lupinus affinis, *Agardh.* California.
angustifolius, *L.* Mediterranean region.
arboreus, *Sims.* California.
Cosentini, *Guss.* Sicily.
elegans, *H. B. & K.* Mexico.
hirsutissimus, *Benth.* California.
Menziesii, *Agardh.* California.
micranthus, *Dougl.* N. America.
mutabilis, *Sw.* New Grenada.
polyphyllus, *Lindl.* California.
pubescens, *Benth.* New Grenada.
pulchellus, *Sweet.* Mexico.
subcarnosus, *Hook.* Texas.
tricolor, *Hort.* Garden origin.

Luzula campestris, *DC.* Europe, &c.
maxima, *DC.* Europe.
nivea, *DC.* Europe.

Lychnis alpina, *Mill.* Northern and Arctic regions.
chalcedonica, *L.* Russia.
Coeli-rosea, *Backh.* Levant.
— var. elegans. *Hort.*

Lychnis—*cont.*
coronaria, *Desr.* Europe.
dioica, *L.* Europe, &c.
Flos-cuculi, *L.* Europe, &c.
Flos-jovis, *Desr.* S. Europe.
fulgens, *Fisch.* Siberia.
Githago, *Scop.* Europe.
haageana, *Lemaire.* Japan.
Lagascae, *Hook. f.* Spain.
pauciflora, *Ledeb.* Siberia.
pyrenaica, *Berger.* Pyrenees.
Viscaria, *L.* Europe.

Lycopersicum esculentum, *Mill.* S. America.

Lycopus europaeus, *L.* Europe, &c.

Lysimachia ciliata, *L.* N. America.
clethroides, *Duby.* Japan.
davurica, *Ledeb.* Siberia, &c.
decurrens, *Forst.* China, &c.
Ephemerum, *L.* S. Europe.
punctata, *L.* Europe, &c.
quadrifolia, *L.* N. America.
vulgaris, *L.* Europe, &c.

Lythrum Graefferi, *Tenore.* Temperate regions.
Salicaria, *L.* N. temperate regions.
— var. rosea.
virgatum, *L.* Europe, &c.

Madia sativa, *Molina.* N. America, &c.

Malcolmia africana, *R. Br.* South Europe, &c.
chia, *DC.* Greece, &c.
maritima, *R. Br.* Mediterranean region.

Malope trifida, *Cav.* Spain and N. Africa.

Malva Alcea, *L.* Europe.
crispa, *L.* Europe.
oxyloba, *Boiss.* Orient.
parviflora, *L.* Europe.
sylvestris, *L.* Europe, &c.

Malvastrum limense, *Ball.* Chili.

Mandragora officinarum, *L.* Mediterranean region.

Marrubium astracanicum, *Jacq.* Asia Minor.

Marrubium—*cont.*
pannonicum, *Reichb.* E. Europe.
peregrinum, *L.* Europe, &c.
vulgare, *L.* Europe, &c.

Matricaria glabra, *Ball.* Marocco.
inodora, *L.* Europe, &c.
— var. discoidea (*DC.*).
Tchihatchewii, *Hort. Kew.* Turkish Armenia.

Matthiola bicornis, *DC.* Asia Minor, &c.
incana, *R. Br.* Mediterranean region.
sinuata, *R. Br.* Mediterranean region.
tricuspidata, *R. Br.* Mediterranean region.

Meconopsis cambrica, *Vig.* Europe.
Wallichi, *Hook.* Himalaya.

Medicago apiculata, *Willd.* Europe.
lappacea, *Desr.* Europe.
littoralis, *Rhode.* Mediterranean region.
lupulina, *L.* N. temperate regions.
minima, *L.* Europe, &c.
Murex, *Willd.* Europe.
orbicularis, *All.* Europe.
sativa, *L.* Europe, &c.
scutellata, *All.* Mediterranean region.
tuberculata, *Willd.* Mediterranean region.
turbinata, *Willd.* Mediterranean region.

Melica altissima, *L.* S. Europe, &c.
ciliata, *L.* Europe, &c.
— var. penicillaris, (*Boiss. & Bal.*).
glauca, *F. Schultz* var. nebrodensis, (*Parl.*). Europe.
nutans, *L.* Europe, &c.

Melilotus alba, *Desr.* Europe, &c.
indica, *All.* Europe, &c.
officinalis, *Lam.* Europe, &c.

Melissa officinalis, *L.* Mediterranean region, &c.

Mentha sylvestris, *L.* var. candicans (*Mill.*), Europe.

Mercurialis annua, *L.* Europe, &c.

Mesembryanthemum pinnatifidum, *L.* S. Africa.
pomeridianum, *L.* S. Africa.
pyropeum, *Haw.* S. Africa.

Mimulus cardinalis, *Dougl.* N. America.
cupreus, *Regel.* Chili.
glabratus, *H. B. & K.* Mexico.
Lewisii, *Pursh.* N. W. America.
luteus, *L.* N. America.

Mirabilis divaricata, *Lowe,* Madeira.
Jalapa, *L.* Tropical America.
longiflora, *L.* Mexico.

Modiola multifida, *Moench.* N. W. America.

Molinia caerulea, *Moench.* Europe, &c.

Monolepis trifida, *Schrad.* Siberia, &c.

Moricandia arvensis, *DC.* Europe, &c.

Morina persica, *L.* Himalaya, &c.

Moscharia pinnatifida, *Ruiz & Pav.* Chili.

Muehlenbergia glomerata, *Trin.* N. America.
mexicana, *Trin.* N. America.
sylvatica, *Torr. & Gray.* N. America.
Willdenovii, *Trin.* N. America.

Muscari Argaei, *Hort.* Greece?
armeniacum, *Baker.* Armenia.
atlanticum, *Boiss. & Reut.* Spain, &c.
grandifolium, *Baker.* Origin uncertain.
Heldreichii, *Boiss.* Greece.
moschatum, *Willd.* Asia Minor.
neglectum, *Guss.* Mediterranean region.
racemosum, *Mill.* Europe, &c.
szovitsianum, *Baker.* Caucacus, &c.

Myosotis arvensis, *Lam.* Europe, &c.
collina, *Hoffm.* Europe.
dissitiflora, *Baker.* Switzerland.
palustris, *Lam.* Europe, &c.

Myosurus minimus, *L.* Europe, &c.

Myrrhis odorata, *Scop.* Europe, &c.

Nardus stricta, *L.* Europe, &c.

Nemesia floribunda, *Lehm.* Cape of Good Hope.
pubescens, *Benth.* Cape of Good Hope.
versicolor, *E. Mey.* Cape of Good Hope.

Nemophila aurita, *Lindl.* California
insignis, *Dougl.* California.
— var. grandiflora, *Hort.*
maculata, *Benth.* California.
parviflora, *Dougl.* N. W. America.

Nepeta azurea, *R. Br.* Abyssinia.
Cataria, *L.* Europe, &c.
concolor, *Boiss. & Heldr.* Asia Minor.
macrantha, *Fisch.* Siberia.
Mussini, *Spreng.* Caucasus.
Nepetella, *L.* S. Europe.
nuda, *L.* S. Europe, &c.
spicata, *Benth.* W. Himalaya.
suavis, *Stapf.* N. W. Himalaya.

Nicandra physaloides, *Gaertn.* Peru.

Nicotiana acuminata, *Hook.* S. America.
alata, *Link & Otto.* S. Brazil.
Langsdorffii, *Schrank.* Brazil.
paniculata, *L.* S. America.
rustica, *L.* Mexico.
Tabacum, *L.* S. America.

Nigella damascena, *L.* Mediterranean region.
hispanica, *L.* Spain, &c.
sativa, *L.* Mediterranean region.

Nolana prostrata, *L.* Peru, Chili, &c.

Nothoscordum fragrans, *Kunth.* Mexico, &c.

Ocimum Basilicum, *L.* Asia.
canum, *Sims.* Asia & Tropical Africa.

Odontospermum aquaticum, *Sch. Bip.* Mediterranean region.

Œnanthe crocata, *L.* Europe.
Lachenali, *C. C. Gmelin.* S. Europe, &c.
peucedanifolia, *Pollich.* Europe.
pimpinelloides, *L.* Europe, &c.
silaifolia, *Bieb.* Europe, &c.
— var. australis, *Wulf.* Carniola.

Œnothera amoena, *Lehm.* California.
berteriana, *Spach.* Chili.
biennis, *L.* N. America.
— var. grandiflora, *Torr. & Gray.*
bistorta, *Nutt.* N.W. America.
densiflora, *Lindl.* California.
dentata, *Cav.* N. America, &c.
fruticosa, *L.* N. America.
— var. Youngii, *Hort.*
glauca, *Michx.* N. America.
odorata, *Jacq.* Chili.
pumila, *L.* N. America.
riparia, *Nutt.* E. United States.
rosea, *Ait.* N. America, &c.
sinnata, *L.* N. America.
speciosa, *Nutt.* N. America.
spiralis, *Hook.* California.
tenella, *Cav.* Chili.
tetraptera, *Cav.* Mexico.
triloba, *Nutt.* N. America.

Omphalodes linifolia, *Moench.* S. Europe.

Onobrychis sativa. *Lam.* Europe, &c.

Ononis arvensis, *L.* Europe.
Natrix, *L.* Mediterranean region.
rotundifolia, *L.* Europe.
spinosa, *L.* Europe.

Onopordon Acanthium, *L.* Europe.
sibthorpianum, *Boiss.* Asia Minor, &c.
tauricum, *Willd.* S. Europe.

Orchis foliosa, *Soland.* Madeira.
incarnata, *L.* Europe, &c.
latifolia, *L.* Europe, &c.
maculata, *L.* Europe and Asia Minor.

Origanum vulgare, *L.* Europe, &c.

Ornithogalum arcuatum, *Stev.* Caucasus.
exscapum, *Tenore.* S. Europe.
fimbriatum, *Willd.* Asia Minor, &c.
narbonense, *L.* Mediterranean region.
nutans, *L.* Europe, &c.
orthophyllum, *Tenore.* Italy.
tenuifolium, *Guss.* S. Europe, &c.

Ornithopus perpusillus, *L.* Europe, &c.

Orobanche Hederae, *Duby.* Europe.
ramosa, *L.* Europe, &c.

Oxalis corniculata, *L.* Temperate & tropical regions.

Oxybaphus nyctagineus, *Sweet.* N. America.

Oxytropis ochroleuca, *Bunge.* Siberia, &c.
pilosa, *DC.* Europe, &c.

Palaua dissecta, *Benth.* Peru, &c.

Pallenis spinosa, *Cass.* Mediterranean region.

Panicum bulbosum, *H. B. & K.* Mexico.
capillare, *L.* W. hemisphere.
colonum, *L.* Tropics
Crus-galli, *L.* S. Europe, &c.
Isachne, *Roth.* Mediterranean region, &c.
miliaceum, *L.* Tropical regions.
sanguinale, *L.* Cosmopolitan.

Papaver aculeatum, *Thunb.* S. Africa.
alpinum, *L.* var. roseum.
Argemone, *L.* Europe, &c.
caucasicum, *Bieb.* Caucasus.
dubium, *L.* Europe.
glaucum, *Boiss. & Hausskn.* Syria.
laevigatum, *Bieb.* Greece, Asia Minor.

Papaver—*cont.*
lateritium, *C. Koch.* Armenia.
nudicaule, *L.* Arctic and Alpine regions.
orientale, *L.* Asia Minor.
— var. bracteatum, (*Lindl.*).
pavoninum, *Mey.* Afghanistan, &c.
pilosum, *Sibth. & Sm.* Greece.
Rhoeas, *L.* Europe, &c.
rupifragum, *Boiss. & Reut.* Spain, Marocco.
— var. atlanticum, *Ball.*
somniferum, *L.* China, &c.

Paradisia Liliastrum, *Bertol.* Europe.

Parietaria officinalis, *L.* S. Europe, &c.

Parnassia nubicola, *Wall.* Himalaya.
palustris, *L.* N. hemisphere.

Parochetus communis, *Buch-Ham.* India, &c.

Peganum Harmala, *L.* Mediterranean region.

Pennisetum cenchroides, *Rich.* Tropical and subtropical regions.
orientale, *Rich.* Orient.
villosum, *R. Br.* Abyssinia.

Pentstemon barbatus, *Roth.* W. United States.
campanulatus, *Willd.* Mexico.
coeruleus, *Nutt.* W. United States.
confertus, *Dougl.* Rocky mountains.
diffusus, *Dougl.* W. North America.
glaber, *Pursh.* W. United States.
glandulosus, *Dougl.* N. America.
Hartwegii, *Benth.* Mexico.
laevigatus, *Soland.* var. Digitalus, *A. Gray.* N. Amer.
ovatus, *Dougl.* N.W. America.
pubescens, *Soland.* N. America.

Perezia multiflora, *Less.* Brazil.

Petunia nyctaginiflora, *Juss.* Argentina.

Peucedanum aegopodioides, *Vandas.* Balkans.
coriaceum, *Reichb. f.* S. Europe.
gallicum, *Latour.* Europe.
graveolens, *Benth.* India.
Ostruthium, *Koch.* Europe.
paucifolium, *Ledeb.* Caucasus.
sativum, *Benth. & Hook. f.* Europe.
Sowa, *Kurz.* India.
verticillare, *Spreng.* S. Europe.

Phacelia bipinnatifolia, *Michx.* N. America.
campanularia, *A. Gray.* California.
divaricata, *A. Gray.* California.
hispida, *A. Gray.* California.
loasaefolia, *Torr.* California.
Parryi, *Torr.* California.
tanacetifolia, *Benth.* California.
viscida, *Torr.* N. America.
Whitlavia, *A. Gray.* California.

Phaecasium lampsanoides, *Cass.* Europe.

Phaenospherma globosa, *Munro.* China.

Phalaris paradoxa, *L.* Mediterranean region.
tuberosa, *L.* Mediterranean region.

Phaseolus aconitifolius, *Jacq.* India, &c.
multiflorus, *Willd.* Mexico.
Mungo, *L.* Tropical regions.
pilosus, *H. B. & K.* S. America.
ricciardianus, *Tenore.* Origin uncertain.
tuberosus, *Lour.* Cochinchina.
vulgaris, *L.* Cultivated.

Phleum asperum, *Jacq.* Europe, &c.
Boehmeri, *Wibel.* Europe, &c.
pratense, *L.* Europe.
— var. nodosum, (*L.*).

Phlomis setigera, *Falc.* Himalaya.
tuberosa, *L.* S. Europe, Asia Minor, &c.
umbrosa, *Turcz.* China, &c.

Physalis Alkekengii, *L.* Europe.
chenopodiifolia, *Lam.* Peru.
Francheti, *Mast.* Japan.
peruviana, *L.* Tropics.
viscosa, *L.* Tropical America.

Physochlaina orientalis, *G. Don.* Orient.

Physostegia virginiana, *Benth.* var. speciosa, *A. Gray.* N. America.

Phyteuma canescens, *Waldst. & Kit.* Europe.
Halleri, *All.* Europe.
limonifolium, *Sibth. & Sm.* S. Europe, Asia Minor.
orbiculare, *L.* Europe.
Scheuchzeri, *All.* Europe.
spicatum, *L.* Europe.

Phytolacca acinosa, *Roxb.* Himalaya, &c.
icosandra, *L.* India, &c.

Picridium tingitanum, *Desf.* Mediterranean region.

Picris echioides, *L.* Europe, &c.
hieracioides, *L.* Europe, &c.

Pimpinella Anisum, *L.* Greece, &c.
magna, *L.* Europe, &c.

Pisum elatius, *Bieb.* Mediterranean region, &c.

Plantago arenaria, *Waldst. & Kit.* Europe, &c.
Candollei, *Rafin.* Chili.
Coronopus, *L.* Europe, &c.
Cynops, *L.* Europe, &c.
Lagopus, *L.* Mediterranean region.
lanceolata, *L.* Europe, &c.
major, *L.* Europe, &c.
maritima, *L.* Europe, &c.
media, *L.* Europe.
Oreades, *Decne.* Colombia.
ovata, *Forsk.* Mediterranean region.
patagonica, *Jacq.* N. & S. America.

Platycodon grandiflorum, *A.DC.* China and Japan.

Platystemon californicus, *Benth.* California.

Pleurospermum pulchrum, *Aitch. & Hemsl.* Afghanistan.

Plumbago micrantha, *Ledeb.* Siberia.

Poa caesia, *Sm.* N. temperate regions.
Chaixii, *Vill.* Europe, &c.
chinensis, *L.* China, &c.
compressa, *L.* N. temperate regions.
pratensis, *L.* N. temperate regions.
trivialis, *L.* N. temperate regions.
violacea, *Bell.* S. Europe.

Podolepis acuminata, *R. Br.* Australia.

Podophyllum Emodi, *Wall.* Himalaya.

Polemonium caeruleum, *L.* N. temperate regions.
flavum, *Greene.* N. America.
himalayanum, *Baker.* Himalaya.
mexicanum, *Cerv.* Mexico.
pauciflorum, *S. Wats.* Mexico.
reptans, *L.* N. America.

Polygonatum verticillatum, *All.* Europe, &c.

Polygonum alpinum, *All.* S. Europe, &c.
aviculare, *L.* N. temperate regions.
Bistorta, *L.* N. regions.
capitatum, *Buch-Ham.* Himalaya.
cilinode, *Michx.* N. America.
compactum, *Hook. f.* Japan.
Convolvulus, *L.* N. temperate regions.
orientale, *L.* Tropics of Old World.
virginianum, *L.* N. America.
viviparum, *L.* N. arctic regions.
Weyrichii, *F. Schmidt.* Saghalien.

Polypogon monspeliensis, *Desf.* Temperate & tropical regions.

Portulaca grandiflora, *Hook.* Brazil.

Potentilla alchemilloides, *Lapeyr.* Pyrenees.
argentea, *L.* N. temperate regions.
— var. calabra (*Tenore*).
arguta, *Pursh.* N. America.
argyrophylla, *Wall.* Himalaya.
chinensis, *Ser.* China.
collina, *Wibel.* Europe, &c.
Detommasii, *Tenore.* S. Europe.
digitata × flabellata. Europe.
glandulosa, *Lindl.* California, &c.
gracilis, *Dougl.* California.
heptaphylla, *Mill.* Europe.
hippiana, *Lehm.* N. W. America.
hirta, *L.* S. Europe, &c.
kotschyana, *Fenzl.* Kurdistan.
kurdica, *Boiss.* Kurdistan.
montenegrina, *Pantoc.* Montenegro.
multifida, *L.* Europe, &c.
nepalensis, *Hook.* Himalaya.
nevadensis, *Boiss.* Spain.
opaca, *L.* Europe.
palustris, *Scop.* N. & Arctic regions.
pyrenaica, *Ramond.* Pyrenees.
recta, *L.* Europe, &c.
— var. laciniata.
— var. palmata.
rupestris, *L.* Europe, &c.
schrenkiana, *Regel.* Central Asia.
semi-laciniata, *Hort.* Garden origin.
sericea, *L.* Caucasus, &c.
Thurberi, *A. Gray.* N. America.
Visianii, *Panč.* Servia.
wrangeliana, *Fisch. & Mey.* Siberia.

Poterium alpinum, *Hort. Kew.* Siberia.
canadense, *A. Gray.* N. America.
officinale, *A. Gray.* Europe, &c.
Sanguisorba, *L.* N. temperate regions.

Pratia angulata, *Hook. f.* New Zealand.

Prenanthes purpurea, *L.* Europe.

Primula capitata, *Hook.* Himalaya.
cortusoides, *L.* Japan, Siberia, &c.
denticulata, *Sm.* Himalaya.
japonica, *A. Gray.* Japan.
Poissoni, *Franch.* China.
rosea, *Royle.* Himalaya.
verticillata, *Forsk.* Arabia.

Prunella grandiflora, *Jacq.* Europe.
— var. laciniata, *Hort.*
— var. rubra, *Hort.*
vulgaris, *L.* Temperate regions.

Psoralea macrostachya, *DC.* California.
physodes, *Hook.* N. W. America.

Pulicaria dysenterica, *Gaertn.* Europe.

Ramondia pyrenaica, *Rich.* Pyrenees.

Ranunculus acris, *L.* Europe, &c.
— var. Steveni.
arvensis, *L.* Europe, &c.
Broteri, *Freyn.* Spain.
brutius, *Tenore.* S. Europe, &c.
caucasicus, *Bieb.* Caucasus.
chaerophyllus, *L.* Mediterranean region, &c.
Cymbalaria, *Pursh.* N. America, &c.
Flammula, *L.* N. temperate regions.
lanuginosus, *L.* Caucasus, &c.
Lingua, *L.* Europe, &c.
muricatus, *L.* Europe, &c.
trilobus, *Desf.* Mediterranean region.

Raphanus maritimus, *Sm.* W. Europe.
sativus, *L.* Europe.
— var. caudatus.

Rapistrum linnaeanum, *Boiss. & Reut.* S. Europe.

Reseda glauca, *L.* Pyrenees.
lutea, *L.* Europe, &c.
Luteola, *L.* Europe, &c.
odorata, *L.* Origin unknown.
Phyteuma, *L.* Mediterranean region.
virgata, *Boiss. & Reut.* Spain and Portugal.

Rhagadiolus Hedypnois, *Fisch. & Mey.* Caucasus, &c.
stellatus, *Gaertn.* S. Europe.

Rheum Emodi, *Wall.* Himalaya.
Franzenbachii, *Muent.* Temperate Asia.
macropterum, *Mart.* Origin uncertain.
officinale, *Baill.* Thibet.
palmatum, *L.* China.
— var. tanghuticum.
Rhaponticum, *L.* Siberia.
undulatum, *L.* Siberia, &c.
webbianum, *Royle.* Himalaya.

Roemeria hybrida, *DC.* S. Europe.

Rudbeckia amplexicaulis, *Vahl.* N. America.
digitata, *Mill.* N. America.
hirta, *L.* N. America.
laciniata, *L.* N. America.
maxima, *Nutt.* Texas.
speciosa, *Wender.* N. America.

Rumex abyssinicus, *Jacq.* Abyssinia.
alpinus, *L.* Europe, &c.
Acetosella, *L.* Europe, &c.
Brownii, *Campd.* Australia.
nepalensis, *Spreng.* Himalaya.
obtusifolius, *L.* Europe, &c.
— var. sylvestris (*Wallr.*).
occidentalis, *S. Wats.* N. W. America.
Patientia, *L.* S. Europe, &c.
pulcher, *L.* Europe, &c.
roseus, *L.* Mediterranean region, &c.
salicifolius, *Weinm.* N. America.
sanguineus, *L.* N. temperate zone.
vesicarius, *L.* Greece, Orient, &c.

Ruta graveolens, *L.* S. Europe.

Sagina glabra, *Fenzl.* Europe.
— var. pilifera, (*Fenzl*).

Salpiglossis linearis, *Hook.* var. grandiflora. Argentina.
sinuata, *Ruiz & Pav.* Chili.

Salvia argentea, *L.* Mediterranean region.
Beckeri, *Trautv.* Caucasus.
cadmica, *Boiss.* Asia Minor.
clandestina, *L.* Europe.

Salvia—*cont.*
Columbariæ, *Benth.* California.
glutinosa, *L.* Europe, &c.
grandiflora, *Etling.* Asia Minor.
hians, *Royle.* Himalaya.
Horminum, *L.* Mediterranean region.
— var. bracteis roseis.
— var. bracteis violaceis.
interrupta, *Schousb.* Marocco.
lanceolata, *Brouss.* N. W. America.
lyrata, *L.* N. America.
nubicola, *Wall.* Himalaya.
nutans, *L.* S. E. Europe.
pratensis, *L.* Europe, &c.
— var. alba.
— var. Baumgarteni, (*Heuff.*)
— var. rosea.
schiedeana, *Stapf.* Mexico.
Sclarea, *L.* Mediterranean region.
sylvestris, *L.* Europe.
tiliaefolia, *Vahl.* Mexico.
Verbenaca, *L.* Europe, &c.
— var. disermas, (*Sibth. & Sm.*)
verticillata, *L.* S. Europe.
virgata, *Ait.* Europe.
viscosa, *Jacq.* Europe.

Samolus Valerandi, *L.* Temperate regions.
— var. americanus, *A. Gray.* N. America.

Sanvitalia procumbens, *Lam.* Mexico.

Saponaria calabrica, *Guss.* Italy, &c.
orientalis, *L.* Orient.
Vaccaria, *L.* Europe, &c.

Saracha Jaltomata, *Schlecht.* Mexico.

Satureja montana, *L.* Europe, &c.

Saussurea albescens, *Hook. f. & Thoms.* Himalaya.

Saxifragra Aizoon, *L.* Europe.
— var. Churchillii, Kern.
— var. Gaudinii, (*Bruegg.*).
— var. incrustata.
— var. minor.
— var. pectinata, (*Schott*).
— var. rotata.
— var. rosularis, *Schleich.*

Saxifragra—*cont.*
bulbifera, *L.* Europe.
caespitosa, *L.* N. & arctic regions.
— var. hirta.
cartilaginea, *Willd.* Caucasus, &c.
cochlearis, *Reichb.* S. Europe.
Cotyledon, *L.* Europe.
— var. pyramidalis, (*Lapeyr.*).
crustata, *Vest.* Alps of Europe.
Geum, *L.* W. Europe.
glaucescens, *Reut.* Spain, &c.
granulata, *L.* Europe.
Hostii, *Tausch.* Europe.
— var. altissima (*Kern.*). Styria.
— var. macnabiana, *Hort.*
hypnoides, *L.* Europe.
lactea, *Turcz.* Siberia.
lingulata, *Bell.* S. Europe.
— var. lantoscana, (*Boiss. & Reut.*).
longifolia, *Lapeyr.* Pyrenees.
— var. pygmaea (*Haw.*).
peltata, *Torr. & Gray.* California.
petraea, *L.* Europe.
rocheliana, *Sternb.* var. coriophylla, (*Griseb.*). E. Europe.
rotundifolia, *L.* Europe.
— var. hirsuta.
umbrosa, *L.* W. Europe.
valdensis, *DC.* Piedmont, &c.

Scabiosa amoena, *Jacq.* Asia Minor, &c.
arvensis, *L.* Europe, &c.
atropurpurea, *L.* S. Europe, &c.
australis, *Wulf.* S. Europe, &c.
Columbaria, *L.* Europe, &c.
graminifolia, *L.* S. Europe, &c.
gramuntia, *L.* Mediterranean region.
integrifolia, *L.* Greece & Asia Minor.
isetensis, *L.* Caucasus, &c.
lancifolia, *Lernat.* Algeria.
lucida, *Vill.* Europe.
macedonica, *Vis.* Macedonia.
micrantha, *Desf.* E. Europe, Asia Minor, &c.

Scabiosa—*cont.*
palaestina, *L.* Syria, &c.
plumosa, *Sibth. & Sm.* Greece, &c.
Portae, *Huter.* Europe.
prolifera, *L.* Syria.
Pterocephala, *L.* Greece.
succisa, *L.* Europe, &c.
sylvatica, *L.* Europe, &c.
ucranica, *L.* S. Europe.
vestina, *Facc.* Europe.

Scandix Balansae, *Reut.* Asia Minor.

Schizanthus pinnatus, *Ruiz & Pav.* Chili.
retusus, *Hook.* Chili & Peru.

Schizopetalum Walkeri, *Sims.* Chili.

Scilla festalis, *Salisb.* W. Europe.
hispanica, *Mill.* Europe.
sibirica, *Andrews.* Asia Minor, &c.
verna, *Huds.* W. Europe.

Scirpus Eriophorum, *Michx.* N. America.
Holoschœnus, *L.* Old World.
setaceus, *L.* Europe, &c.
triqueter, *L.* Europe, &c.

Scleranthus annuus, *L.* Europe, &c.
perennis, *L.* Europe, &c.

Sclerocarpus uniserialis, *Benth. & Hook. f.* Mexico.

Scolymus maculatus, *L.* Europe.

Scopolia lurida, *Dun.* Himalaya.

Scorpiurus vermiculata, *L.* Mediterranean region.

Scorzonera hispanica, *L.* S. Europe.
laciniata, *L.* Mediterranean region, &c.

Scrophularia alata, *Gilib.* Europe.
aquatica, *L.* Europe.
nodosa, *L.* N. temperate regions.
Scorodonia, *L.* Europe, &c.
sylvatica, *Boiss. & Heldr.* Greece.
vernalis, *L.* Europe.

Scutellaria albida, *L.* S. E. Europe.
alpina, *L.* Europe, &c.
altissima, *L.* Caucasus, &c.
baicalensis, *Georgi.* Siberia, &c.
galericulata, *L.* N. temperate regions.

Secale Cereale, *L.* Orient.

Sedum Aizoon, *L.* Siberia.
album, *L.* Europe, &c.
coeruleum, *Vahl.* S. Europe.
Ewersii, *Ledeb.* Siberia, &c.
hispanicum, *L.* S. Europe.
hybridum, *L.* Siberia.
maximum, *Sut.* Europe, &c.
— var. atropurpureum.
middendorfianum, *Maxim.* Amurland.
roseum, *Scop.* N. temperate regions.
rupestre, *L.* Europe.
Telephium, *L.* Europe, &c.
villosum, *L.* Europe, &c.
wallichianum, *Hook. f. & Thoms.* Himalaya.

Selinum Gmelini, *Bray.* N.regions.

Sempervivum arvernense, *Lecoq & Lamotte.* France.
mettenianum, *Schnittsp.* Switzerland.
montanum, *L.* Alps and Pyrenees.
tectorum, *L.* Europe, &c.
— var rusticanum, *Hort.*

Senecio adonidifolius, *Loisel.* Europe.
aegyptius, *L.* Egypt.
Cineraria, *DC.* Mediterranean region.
diversifolius, *Wall.* Himalaya.
Doria, *L.* Europe, &c.
Doronicum, *L.* Europe.
elegans, *L.* S. Africa.
japonicus, *Sch. Bip.* Japan.
Kaempferi, *DC.* Japan.
macrophyllus, *Bieb.* Caucasus.
nemorensis, *L.* S. Europe, &c.
sarracenicus, *L.* Europe, &c.
suaveolens, *Ell.* N. America.
thyrsoideus, *DC.* S. Africa.
viscosus, *L.* Europe, &c.

Serratula coronata, *L.* Siberia.
— var. macrophylla.
Gmelinii, *Ledeb.* Siberia.
quinquefolia, *Bieb.* Caucasus.
tinctoria, *L.* Europe.

Sesamum indicum, *L.* Tropical regions.

Sesceli gummiferum, *Sm.* Crimea.
Libanotis, *Koch.* Europe, &c.
osseum, *Crantz.* Europe.

Sesleria cylindrica, *DC.* Europe.

Setaria italica, *Beauv.* Tropical and subtropical regions.
macrochaeta, *Spreng.* India, &c.
verticillata, *Beauv.* Cosmopolitan.
viridis, *Beauv.* Cosmopolitan.

Sicyos bryoniaefolia, *Moris.* Chili.

Sidalcea candida, *A. Gray.* New Mexico.

Sideritis scordioides, *L.* S. Europe.

Silene alpestris, *Jacq.* Alps.
Armeria, *L.* Europe.
chloraefolia, *Sm.* var. swertifolia. Asia Minor.
Chouletii, *Coss.* Algeria.
ciliata, *Pourr.* S.W. Europe.
colorata, *Poir.* Mediterranean region.
conoidea, *L.* Europe.
cretica, *L.* S. Europe.
Cucubalus, *Wibel.* Europe, &c.
echinata, *Otth.* S. Europe.
fimbriata, *Sims.* Caucasus.
Fortunei, *Vis.* China.
fuscata, *Link.* Mediterranean region.
gallica, *L.* Europe.
glauca, *Pourr.* Spain.
italica, *Pers.* Mediterranean region.
juvenalis, *Delile.* Asia Minor.
laeta, *A. Br.* W. Mediterranean region.
linicola, *C. C.Gmel.* Germany.
longicilia, *Otth.* Spain, &c.
longiflora, *Ehrh.* E. Europe, &c.
Muscipula, *L.* Mediterranean region.

Silene—*cont.*
noctiflora, *L.* Europe, &c.
nutans, *L.* Europe, &c.
obtusifolia, *Willd.* W. Mediterranean region.
paradoxa, *L.* S. Europe.
pendula, *L.* Mediterranean region.
pensylvanica, *Michx.* N. America.
portensis, *L.* Spain.
pseudo-atocion, *Desf.* N. Africa.
quadrifida, *L.* Europe.
rubella, *L.* Europe, &c.
Sartori, *Boiss.* Greece.
Saxifraga, *L.* Europe.
Schafta, *Gmel.* Caucacus.
stylosa, *Bunge.* Siberia.
tatarica, *Pers.* E. Europe, &c.
tenuis, *Willd.* Siberia.
undulata, *Ait.* S. Africa.
vallesia, *L.* Europe.
verecunda, S. *Wats.* California.
vesiculifera, *J. Gay.* Asia Minor.
vespertina, *Retz.* Mediterranean region.

Silphium integrifolium, *Michx.* N. America.
perfoliatum, *L.* N. America.
scaberrimum, *Ell.* N. America.

Silybum eburneum, *Coss. & Dur.* N. Africa, &c.
Marianum, *Gaertn.* Europe.

Sisymbrium assoanum, *Losc. & Pard.* Spain.
austriacum, *Jacq.* Europe.
erysimoides, *Desf.* Mediterranean region, &c.
hispanicum, *Jacq.* Spain.
multifidum, *Willd.* Siberia.
officinale, *Scop.* S. Europe, &c.
polyceratium, *L.* Europe, &c.
Sophia, *L.* Temperate regions.
strictissimum, *L.* Europe.
tanacetifolium, *L.* Europe.

Sisyrinchium angustifolium, *Mill.* N. America.
striatum, *Sm.* Argentina, &c.

Sium latifolium, *L.* Europe, &c.

Smilacina racemosa, *Desf.* N. America.
stellata, *Desf.* N. America.

Smyrnium Olusatrum, *L.* Europe, &c.

Solanum guineense, *Lam.* Trop. Africa.
rostratum, *Dun.* Mexico.
villosum, *Willd.* Europe.

Solidago arguta, *Ait.* N. America.
canadensis, *L.* N. America.
Drummondi, *Torr & Gray.* N. America.
elliptica, *Ait.* Origin uncertain.
elongata, *Nutt.* N. America.
glomerata, *Michx.* S. United States.
lithospermifolia, *Willd.* Habitat unknown.
Virgaurea, *L.* N. temperate regions.

Sonchus oleraceus, *L.* Europe.
palustris, *L.* Europe, &c.

Spartina Schreberi, *J. F. Gmel.* N. America.

Specularia falcata, *A.DC.* Mediterranean region.
— var. castellana, *Lange.*
pentagonia, *A.DC.* Asia Minor.
perfoliata, *A.DC.* N. America.
Speculum, *A.DC.* Europe, &c.

Spergula arvensis, *L.* Europe.

Spiraea Aruncus, *L.* N. temperate regions.
digitata, *Willd.* Siberia.
Ulmaria, *L.* Europe, &c.

Stachys alpina, *L.* Europe.
— var. intermedia.
arvensis, *L.* N. temperate regions.
Betonica, *Benth.* Europe, &c.
germanica, *L.* Europe, &c.
grandiflora, *Benth.* Asia Minor, &c.
spinulosa, *Sibth. & Sm.* Greece, &c.
setifera, *C. A. Mey.* Asia Minor.
sylvatica, *L.* Europe, &c.

Statice bellidifolia, *Gouan*. Europe.
cordata, *L.* Mediterranean region.
Gmelinli, *Willd.* Caucasus, &c.
gougetiana, *Girard*. Spain.
Limonium, *L.* Europe, &c.
sinuata, *L.* Mediterranean region.
speciosa, *L.* Caucasus, &c.
Suworowii, *Regel.* Central Asia.
tatarica, *L.* Caucasus, &c.
tomentella, *Boiss.* S Russia.

Stevia Eupatoria, *Willd.* Mexico.
ovata, *Lag.* Mexico.

Stipa Aristella, *L.* Mediterranean region.
Calamagrostis, *Wahlenb.* Europe.
pennata, *L.* Europe, &c.
sibirica, *Lam.* Siberia, &c.

Suaeda maritima, *Dum.* N. & S. temperate regions.

Succowia balearica, *Medic.* Mediterranean region.

Swertia cordata, *Wall.* Himalaya.
perennis, *L.* N. temperate regions.

Symphyandra Hofmanni, *Pant.* Bosnia.
pendula, *A.DC.* Caucasus.
Wanneri, *Heuff.* Transsylvania.

Symphytum officinale, *L.* Europe.

Syrenia sessiliflora, *Ledeb.* S. Russia, &c.

Tagetes lucida, *Car.* Mexico.
patula, *L.* Mexico.
pusilla, *H.B. & K.* Ecuador.

Tamus communis, *L.* Europe, &c.

Tanacetum vulgare, *L.* Europe, &c.

Taraxacum gymnanthum, *DC.* Mediterranean region.

Telephium Imperati, *L.* Mediterranean region, &c.

Tellima grandiflora, *R.Br.* N.W. America.

Tetragonia crystallina, *L'Herit.* Peru.
expansa, *Murr.* Australia.

Teucrium Arduini, *L.* S. Europe.
aureum, *Schreb.* S. Europe.
Botrys, *L.* Europe, &c.
canadense, *L.* N. America.
Chamaedrys, *L.* Europe, &c.
— var. aurea.
multiflorum, *L.* Spain.
Scorodonia, *L.* Europe.

Thalictrum angustifolium, *L.* Europe, &c.
aquilegifolium, *L.* Europe, &c.
— var. purpureum.
flavum, *L.* Europe, &c.
— var. sphaerocarpum, (*Lej. & Court.*).
glaucum, *Desf.* Spain.
minus, *L.* Europe, &c.
— var. affine (*Jord.*).
— var. concinnum (*Willd.*).
— var. elatum (*Jacq.*).
— var. pubescens (*Schleich.*).
— var. purpurascens (*Georgi*).
squarrosum, *Stephan.* Siberia.

Thelesperma filifolium, *A. Gray.* N.W. America.

Thermopsis caroliniana, *M. A. Curtis.* N. America.
lanceolata, *R. Br.* Siberia.
montana, *Nutt.* N. America.

Thadiantha dubia, *Bunge.* China.

Thlaspi alliaceum, *L.* Europe.
arvense, *L.* Europe, &c.
ceratocarpon, *Murr.* Asia Minor, &c.
perfoliatum, *L.* Europe, &c.
praecox, *Wulf.* Austria.

Thymus comosus, *Heuff.* Transsylvania.

Tinantia fugax, *Scheidw.* Tropical America.

Tofieldia calyculata, *Wahlenb.* Europe, &c.

Tolmiea Menziesii, *Torr. & Gray.* N. W. America.

Tolpis barbata, *Gaertn.* Mediterranean region.

Tordylium cordatum, *Poir.* Crete, &c.

Trachelium caeruleum, *L.* W. Mediterranean region.

Trachymene pilosa, *Sm.* Australia.

Tragopogon orientalis, *L.* Europe, &c.
pratensis, *L.* Europe, &c.

Tricholepis furcata, *DC.* Himalaya.

Tridax trilobata, *Hemsl.* Mexico.

Trifolium agrarium, *L.* Europe, &c.
armenium, *Willd.* Asia Minor.
bifidum, *Gray.* var. decipiens. California.
glomeratum, *L.* Europe.
hybridum, *L.* Europe.
incarnatum, *L.* Europe.
Lagrangei, *Boiss.* Orient.
leucanthum, *Bieb.* Crimea, &c.
medium, *L.* Europe.
minus, *Sm.* Europe.
pannonicum, *L.* Europe, &c.
Perreymondi, *Gren. & Godr.* France.
pratense, *L.* Europe.
repens, *L.* Europe.
resupinatum, *L.* Europe.
roscidum, *Greene.* California.
rubens, *L.* Europe.
spumosum, *L.* Mediterranean region.
squarrosum, *L.* S.W. Europe.
tomentosum, *L.* S. Europe.
tridentatum, *Lindl.* N.W. America.

Triglochin maritimum, *L.* Europe.
palustre, *L.* Europe.

Trigonella Balansae, *Boiss. & Reut.* Asia Minor, &c.
corniculata, *L.* S. Europe.
coerulea, *Ser.* E. Europe.
cretica, *Boiss.* Crete.
Foenum-graecum, *L.* S. Europe.
ovalis, *Boiss.* Spain.
polycerata, *L.* S. Europe.
radiata, *Boiss.* Orient.

Trillium grandiflorum, *Salisb.* N. America.

Trinia Hoffmanni, *Bieb.* E. Europe, &c.
Kitaibelii, *Bieb.* E. Europe, &c.

Tripteris cheiranthifolia, *Schultz.* Abyssinia.

Trisetum flavescens, *Beauv.* Europe, &c.
rigidum, *Roem. & Schult.* Asia Minor, &c.

Triticum durum, *Desf.* S. Europe, N. Africa.
monococcum, *L.* Europe.
ovatum, *Rasp.* Europe.
triunciale, *Rasp.* Europe.
villosum, *Beauv.* Europe.
violaceum, *Hornem.* N. Europe.

Tritonia crocosmaeflora, *Hort.* Garden origin.
Pottsii, *Benth.* S. Africa.

Trollius asiaticus, *L.* Siberia, &c.
europaeus, *L.* Europe, &c.
— var. napellifolius.

Tropaeolum aduncum, *Sm.* Peru, &c.
majus, *L.* Peru.
minus, *L.* Peru.

Troximon, America.
grandiflorum, *A. Gray.* N.W. America.
heterophyllum, *Greene.* N.W. America.
laciniatum, *A. Gray.* N. America.

Tunica illyrica, *Boiss.* S. Europe, &c.
prolifera, *Scop.* Europe, &c.
Saxifraga, *Scop.* Europe, &c.

Typha angustifolia, *L.* Europe, &c.
latifolia, *L.* Europe, &c.
stenophylla, *Fisch. & Mey.* Europe.

Urospermum Dalechampii, *Desf.* S. Europe.
picroides, *Desf.* S. Europe.

Ursinia pulchra, *N. E. Br.* S. Africa.

Urtica membranacea, *Poir.* S. Europe.
pilulifera, *L.* Europe.
— var. balearica, (*L.*).

Urtica—*cont.*
thunbergiana, *Sieb. & Zucc.* Japan.

Valeriana alliariaefolia, *Vahl.* Europe.
officinalis, *L.* Europe.
— var. exaltata, (*Mikan*).
— var. sambucifolia, (*Mikan*).
Phu, *L.* Caucasus.

Valerianella carinata, *Loisel.* Europe, &c.
coronata, *DC.* S. Europe.
dentata, *Poll.* Europe, &c.
echinata, *DC.* Europe, &c.
eriocarpa, *Desv.* Europe, &c.
olitoria, *Poll.* Europe, &c.
vesicaria, *Moench.* S. Europe, &c.

Veratrum album, *L.* Europe, &c.
nigrum, *L.* Europe, &c.
viride, *Ait.* N. America.

Verbascum Blattaria, *L.* Europe.
Chaixii, *Vill.* S.W. Europe.
malacotrichum, *Boiss.& Heldr.* S. Europe, &c.
nigrum, *L.* Europe, &c.
phlomoides, *L.* Europe, &c.
pyramidatum, *Bieb.* Crimea, &c.
sinuatum, *L.* Europe, &c.
speciosum, *Schrad.* E. Europe.
Thapsus, *L.* Europe.
virgatum, *With.* Europe.

Verbena Aubletia, *L.* N. America.
bonariensis, *L.* S. America.
caroliniana, *Michx.* S. United States.
officinalis, *L.* Europe, &c.

Vernonia altissima, *Nutt.* United States.

Veronica aphylla, *L.* Europe, &c.
— var. pinnatifida.
Bidwillii, *Hook. f.* N. Zealand.
Buxbaumii, *Tenore.* Europe, &c.
exaltata, *Maud.* Siberia.
incana, *L.* S. Russia, &c.
incisa, *Ait.* Siberia.
longifolia, *L.* Europe, &c.
— var. subsessilis, *Miq.*
Lyallii, *Hook f.* N. Zealand.
officinalis, *L.* Europe, &c.
repens, *DC.* Corsica.

Veronica—*cont.*
saxatilis, *Scop.* Europe.
serpyllifolia, *L.* Europe, &c.
spicata, *L.* Europe, &c.
Teucrium, *L.* Europe, &c.
— var. latifolia, (L.).
virginica, *L.* N. America.
— var. japonica, (*Steud.*).

Vicia amphicarpa, *Dorth.* S. Europe, &c.
argentea, *Lapeyr.* Pyrenees.
atropurpurea, *Desf.* S. Europe.
bithynica, *L.* Mediterranean region.
calcarata, *Desf.* Mediterranean region, &c.
Cracca, *L.* N. hemisphere.
disperma, *DC.* S. W. Europe.
Faba, *L.* Cultivated.
— var. equina, (*Steud.*).
gigantea, *Hook.* N. W. America.
hirsuta, *S. F. Gray.* Europe, &c.
narbonensis, *L.* Mediterranean region.
pannonica, *Crantz.* Europe.
pyrenaica, *Pourr.* Pyrenees.
sativa, *L.* Europe, &c.
sepium, *L.* Europe, &c.
sicula, *Guss.* Sicily.
sylvatica, *L.* Europe.
unijuga, *A. Braun.* Siberia.
varia, *Host.* Europe.
villosa, *Roth.* Europe, &c.

Vincetoxicum fuscatum, *Reichb. f.* E. Europe, &c.
nigrum, *Moench.* Europe, &c.
officinale, *Moench.* Europe.

Viola elatior, *Fries.* Europe, &c.
Jooi, *Janka.* Transylvania.
lactea, *Sm.* Europe.
odorata, *L.* Europe, &c.
palustris, *L.* N. temperate regions.
striata, *Ait.* N. America.
syrtica, *Sünd.* Europe.
sylvestris, *Lam.* Europe, &c.
tricolor, *L.* Europe, &c.

Wahlenbergia capensis, *A.DC.* S. Africa.
graminifolia, *A.DC.* Italy, &c.
undulata, *A.DC.* S. Africa.

Wulfenia carinthiaca, *Jacq.* Carinthia.

Xanthium strumarium, *L.* Europe, &c.

Xanthocephalum gymnospermoides, *Benth. & Hk. f.* Arizona.

Xeranthemum annuum, *L.* S. Europe, &c.

cylindraceum, *Sibth. & Sm.* Europe, &c.

Zaluzianskya capensis, *Walp.* S. Africa.

Zea Mays, *L.* Cultivated.

Zinnia elegans, *Jacq.* Mexico.
multiflora, *L.* Mexico.
tenuiflora, *Jacq.* Mexico, &c.

Ziziphora capitata, *L.* E. Europe.
tenuior, *L.* S. Europe, Asia Minor, &c.

Zygadenus elegans, *Pursh.* N. America.

TREES AND SHRUBS.

Acanthopanax sessiliflorum, *Seem.* China.

Acer argutum, *Maxim.* Japan.
campestre, *L.* Europe.
— var. collinum, *Wallr.*
circinatum, *Pursh.* N.W. America.
Heldreichi, *Orph.* E. Europe.
hyrcanum, *Fisch. & Mey.* Caucasus.
insigne, *Boiss. & Buhse.* N. Persia.
laetum, *C. A. Mey.* Caucasus, &c.
macrophyllum, *Pursh.* California, &c.
monspessulanum, *L.* Europe.
opulifolium, *Vill.* Europe.
— var. neapolitanum.
pictum, *Thunb.* Mandshuria, &c.
platanoides, *L.* Europe.
— var. integrilobum.
Pseudo-Platanus, *L.* Europe, &c.
— lutescens.
— var. purpureum, *Hort.*
saccharinum, *Wangenh.* N. America.
tataricum, *L.* E. Europe, &c.
Volxemi, *Mast.* Caucasus.

Ailantus glandulosa, *Desf.* China.

Akebia lobata, *Decne.* Japan.

Alnus cordifolia, *Tenore.* Italy.
firma, *S. & Z.* Japan.
glutinosa, *Gaertn.* Europe.
incana, *Willd.* N. hemisphere.
japonica, *Sieb.& Zucc.* Japan.
serrulata, *Willd.* N. America.
subcordata, *C. A. Mey.* Caucasus.
viridis, *DC.* Northern hemisphere.

Amelanchier alnifolia, *Nutt.* N. America.
canadensis, *Torr. & Gray.* N. America.

Amelanchier—*cont.*
— var. oblongifolia, *Torr. & Gray.*
vulgaris, *Moench.* Europe, &c.

Amorpha fruticosa, *L.* South United States.

Aralia chinensis, *L.* China.
spinosa, *L.* N. America.

Arbutus Andrachne, *L.* Levant.

Arctostaphylos Uva Ursi, *Spreng.*
— var. californica.

Asimina triloba, *Dunal.* S. United States.

Aucuba japonica, *Thunb.* Japan.

Baccharis halimifolia, *L.* N. America.

Berberis angulosa, *Wall.* Himalaya.
aristata, *DC.* Himalaya.
— var. floribunda.
Aquifolium, *Pursh.* W. N. America.
— var. fascicularis, *Nichols.*
— var. murrayana, *Hort.*
buxifolia, *Lam.* Chili.
canadensis, *Pursh.* N. America.
concinna, *Hook. f.* Himalaya.
Darwinii, *Hook.* Chili.
repens, *Lindl.* N. America.
Sieboldii, *Miq.* China, Japan.
sinensis, *Desf.* China, &c.
spathulata, *Schrad.* Origin uncertain.
Thunbergi, *DC.* Japan.
virescens, *Hook. f.* Himalaya.
vulgaris, *L.* Europe, &c.
— var. iberica, *Hort.*
— var. foliis purpureis.
wallichiana, *DC.* Himalaya.

Betula alba, *L.* N. Hemisphere.
— var. pubescens, *Loud.*
davurica, *Pall.* Siberia, &c.
lenta, *L.* N. America.
lutea, *Michx.* N. America.

Betula—*cont.*
papyrifera, *Marsh.* N. America.
populifolia, *Marsh.* N. America.
pumila, *L.* N. America.
ulmifolia, *Sieb. & Zucc.* Japan.

Bruckenthalia spiculifolia, *Reichb.* Europe, &c.

Bryanthus empetriformis, *A. Gray.* N. America.

Buddleia japonica, *Hemsl.* Japan.

Bumelia lanuginosa, *Pers.* N. America.

Buxus sempervirens, *L.* Europe, &c.
— var. latifolia.
— var. prostrata.

Calluna vulgaris, *Salisb.* Europe, &c.

Calophaca wolgarica, *Fisch.* S Russia.

Calycanthus glaucus, *Willd.* N. America.
occidentalis, *Hook. & Arn.* California.

Caragana arborescens, *Lam.* Siberia, &c.
— var. nana.
— var. Redowskii.
frutescens, *DC.* South Russia to Japan.
microphylla, *Lam.* Altai, &c.
pygmaea, *DC.* Siberia.
— var. aurantiaca.

Carmichaelia australis, *R. Br.* N. Zealand.
flagelliformis, *Colenso.* N. Zealand.

Carpinus Betulus, *L.* Europe, &c.
— var. incisa.
caroliniana, *Walt* N. America.
orientalis, *Mill.* S. Europe.

Carya porcina, *Nutt.* N. America.

Cassandra calyculata, *D. Don.* N. Hemisphere.

Cassinia fulvida, *Hook. f.* N. Zealand.

Catalpa cordifolia, *Jaume.* W. Kentucky, Tennessee, &c.

Ceanothus americanus, *L.* E. United States.
Arnoldi, *Hort.* Garden origin.
azureus, *Desf.* Mexico.
grandiflorus, *Hort.* Garden origin.
spinosus, *Nutt.* California.

Celastrus articulatus, *Thunb.* Japan.
scandens, *L.* N. America.

Celtis occidentalis, *L.* N. America.
Tournefortii, *Lam.* Orient.

Cephalanthus occidentalis, *L.* N. America.

Cercis Siliquastrum, *L.* S. Europe, &c.

Cistus laurifolius, *L.* S.W. Europe.

Cladrastis amurensis, *Benth.* Amurland.

Clematis alpina, *Mill.* N. Europe, &c.
Flammula, *L.* S. Europe, &c.
fusca, *Turcz.* China & Japan.
integrifolia, *L.* Europe.
lanuginosa, *Lindl.* China.
orientalis, *L.* Orient.
Pitcheri, *Torr. & Gray.* var. lasiostylis. S. United States.
songorica, *Bunge*, Siberia.
virginiana, *L.* United States.
Vitalba, *L.* Europe, &c.
Viticella, *L.* var. rubra.

Clethra alnifolia, *L.* E. United States.

Colutea arborescens, *L.* Eur., &c.
— var. nepalensis.
cruenta, *Ait.* Orient.

Cocculus carolinus, *DC.* S. United States.
melanocalyx, *Boiss.* Asia Minor.

Coriaria japonica, *A. Gray.* Japan.

Cornus alba, *L.* N. Asia.
alternifolia, *L. f.* N. America.
Amomum, *Mill.* N. America.
Baileyi, *Coult. & Evans.* N. America.
candidissima, *Marsh.* N. America.
circinata, *L'Herit.* N. America.
glabrata, *Benth.* California.
Mas, *L.* Europe, &c.

Cornus—*cont.*
pubescens, *Nutt.* West N. America.
sanguinea, *L.* Europe.

Corylus rostrata, *Ait.* N. America.

Cotoneaster acuminata, *Lindl.* Himalaya.
affinis, *Lindl.* Himalaya.
bacillaris, *Wall.* Himalaya.
— var. floribunda, *Hort.*
buxifolia, *Wall.* Himalaya.
frigida, *Wall.* Himalaya.
horizontalis, *Dcne.* Himalaya.
integerrima, *Medic.* Europe, &c.
laxiflora, *Jacq.* Siberia.
lucida, *Schlecht.* Origin unknown.
microphylla, *Wall.* Himalaya.
multiflora, *Bunge.* China.
Nummularia, *Fisch.* & *Mey.* Europe, Asia.
rotundifolia, *Wall.* Himalaya.
Simonsii, *Baker.* Himalaya.
thymifolia, *Baker.* Himalaya.

Cratægus Carrièrei, *Vauvel.* Garden origin.
coccinea, *L.* E. United States.
—var. macracantha, *Dudley.*
chlorosarca, *Maxim.* Mandshuria.
Crus-Galli, *L.* N. America.
Douglasii, *Lindl.* West. N. America.
— var. rivularis, *Nutt.*
flava, *Ait.* S.E. United States.
heterophylla, *Fluegg.* Orient.
hiemalis, *Lange.* Origin unknown.
melanocarpa, *Bieb.* Caucasus.
mollis, *Scheele.* United States.
monogyna, *Jacq.* Old World.
— var. siberica, *Loud.*
nigra, *Waldst.* & *Kit.* E. Europe.
orientalis, *Pall.* Orient.
— var. sanguinea.
oxyacanthoides, *Thuill.* Old World.
— var. fructu luteo.
pentagyna, *Kit.* E. Europe.
pinnatifida, *Bunge.*

Cratægus—*cont.*
punctata, *Jacq.* E. and N. America.
Pyracantha, *Pers.* S. Europe, &c.
sinaica, *Boiss.* Orient.
tanacetifolia, *Pers.* Orient.
tomentosa, *L.* E. United States.
uniflora, *Muench.* S. United States.

Cryptomeria japonica, *D. Don.* Japan, China.

Cupressus Benthami, *Endl.* Mexico.
lawsoniana, *Murr.* California, &c.
lusitanica, *Mill.* Locality unknown.
nootkatensis, *Lamb.* N. W. America.
obtusa, *C. Koch.* Japan.
pisifera, *C. Koch.* Japan.
thyoides, *L.* N. America.

Cytisus albus, *L.* S.W. Europe.
biflorus, *L'Herit.* Europe.
capitatus, *Jacq.* Europe.
nigricans, *L.* Europe.
praecox, *Hort.* Garden origin.
purgans, *Boiss.* Europe.
purpureus, *Scop.* E. Europe.
scoparius, *L.* Europe.
— var. andréanus.
— var. pendulus, *Hort.*
sessilifolius, *L.* Europe.

Daboëcia polifolia, *D. Don.* W. Europe.

Daphne Mezereum, *L.* Europe.
— var. flore albo.

Desmodium ciliare, *DC.* N. America.
cuspidatum, *Hook.* N. America.
marilandicum, *Boott.* N. America.
viridiflorum, *Beck.* N. America.

Deutzia crenata, *S.* & *Z.* Japan.
scabra, *Thunb.* Japan.

Diervilla hortensis, *S.* & *Z.* Japan.
sessilifolia, *Buckl.* Carolina, Tennessee.
—var. splendens.

Dorycinum suffruticosum, *Vill.* Macedonia.

Eccremocarpus scaber, *Ruiz & Pav.* Chili.

Ehretia elliptica, *DC.* Japan, &c.

Elaeagnus argentea, *Pursh.* N. America.
longipes, *A. Gray.* Japan.
umbellata, *Thunb.* Japan.

Erica ciliaris, *L.* Europe.
cinerea, *L.* Europe.
scoparia, *L.* Europe.
stricta, *Donn.* S. Europe.
Tetralix, *L.* Europe.
vagans, *L.* Europe.
Watsoni, *DC.* Britain.

Escallonia punctata, *DC.* Chili.
rubra, *Pers.* Chili.

Euonymus atropurpureus, *Jacq.* N. America.
europaeus, *L.* Europe.
— var. purpureus.
hamiltonianus, *Wall.* Himalaya.
latifolius, *Scop.* Europe.
macropterus, *Rupr.* Amurland.
oxyphyllus, *Miq.* Japan.

Exochorda Alberti, *Regel.* Persia.
grandiflora, *Lindl.* China.

Fendlera rupicola, *Gray.* S. W. United States.

Fontanesia philliracoides, *Labill.* Asia Minor.

Forsythia suspensa, *Vahl.* Japan, &c.

Fraxinus bungeana, *DC.* China, Japan.
nigra, *Marsh.* N. America.
Ornus, *L.* Europe.
rhynchophylla, *Hance.* China.

Fremontia californica, *Torr.* California.

Gaultheria procumbens, *L.* N. America.
pyrolaefolia, *Hook. f.* Himalaya.
Shallon, *Pursh.* W. N. America.

Gaylussacia frondosa, *Torr. & Gray.* N. America.
resinosa, *Torr. & Gray.* N. America.

Genista aethnensis, *DC.* Sicily.
anglica, *L.* Europe.
germanica, *L.* Europe.
hispanica, *L.* Europe.
pilosa, *L.* Europe.
radiata, *Scop.* S. Europe.
ramosissima, *Poir.* Europe.
sagittalis, *L.* Europe.
tinctoria, *L.* var. elatior. Europe.
virgata, *DC.* Madeira.

Gleditschia japonica, *Miq.* Japan.

Halesia corymbosa, *Nichols.* Japan.
parviflora, *Michx.* Georgia and Florida.
tetraptera, *L.* N. America.

Hedera Helix, *L.* Europe, &c.

Hedysarum multijuga, *Maxim.* Mongolia.

Helianthemum vulgare, *Gaertn.* Europe.

Hippophae rhamnoides, *L.* Eur. &c.

Hovenia dulcis, *Thunb.* N. Asia.

Hydrangea arborescens, *L.* N. America.
paniculata, *S. & Z.* Japan.
pubescens, *Decne.* Japan, &c.
radiata, *Walt.* S.E. United States.

Hypericum adpressum, *Barton.* N. America.
Androsaemum, *L.* Europe.
Ascyron, *L.* N. Asia, &c.
calycinum, *L.* Orient.
densiflorum, *Pursh.* N. America.
Drummondii, *Torr. & Gray.* N. America.
elatum, *Ait.* N. America.
erectum, *Thunb.* Japan.
hircinum, *L.* Europe.
hookerianum, *Wight & Arn.* Himalaya.
kalmianum, *L.* N. America.
maculatum, *Walt.* N. America.
patulum, *Thunb.* India, China, &c.

Ilex Aquifolium, *L.* Europe.
— var. platyphylla, *Hort.*
glabra, *Gray.* N. America.
lucida, *Torr. & Gray.* N. America.
macropoda, *Miq.* Japan.
opaca, *Ait.* N. America.
rugosa, *F. Schmidt.* Saghalien.
verticillata, *A. Gray.* N. America.

Jasminum fruticans, *L.* Europe, &c.
humile, *L.* Himalaya.

Juniperus chinensis, *L.* N. Asia.
sphaerica, *Lindl.* N. China.

Kalmia angustifolia, *L.* N. America.
— var. nana.
— var. ovata.
glauca, *Ait.* N. America.
latifolia, *L.* N. America.

Laburnum alpinum, *J. S. Presl.* Europe.
— var. biferum, *Hort.*
vulgare, *J. S. Presl.* Europe.

Larix europaea, *DC.* Europe.
leptolepis, *Endl.* Japan.
pendula, *Salisb.* N. America.

Lavatera assurgentiflora, *Kellogg.* California.

Ledum latifolium, *Ait.* N. America.
palustre, *L.* Arctic Regions.

Leiophyllum buxifolium, *Ell.* E. United States.

Lespedega Buergeri, *Miq.* Japan.
repens, *Barton*, N. America.
Stuvei, *Nutt.* N. America.
violacea, *Pers.* N. America.

Leucothoe axillaris, *D. Don.* N. America.
Catesbaei, *A. Gray.* Virginia, &c.
racemosa, *A. Gray.* N. America.

Leycesteria formosa, *Wall.* Himal.

Ligustrum Ibota, *Sieb.* Japan.
japonicum, *Thunb.* Japan, China, &c.
sinense, *Lour.* China.
vulgare, *L.* Europe.

Liriodendron tulipifera, *L.* United States.

Lonicera alpigena, *L.* Europe, Himalaya.
angustifolia, *Wall.* Himalaya.
Caprifolium, *L.* Europe, Asia.
chrysantha, *Turcz.* Amurland, &c.
Griffithii, *Hook. f. & Thoms.* Afghanistan.
iberica, *Bieb.* Caucasus.
japonica, *Thunb.* China and Japan.
Korolkowi, *Stapf.* Turkestan.
Morrowii, *A. Gray.* Japan.
nigra, *L.* Europe.
orientalis, *Lam.* Asia Minor.
Periclymenum, *L.* Europe.
segreziensis, *Hort.* Garden origin.
Sullivantii, *A. Gray.* N.E. United States.
tatarica, *L.* Siberia.
— var. punicea.
Xylosteum, *L.* Europe.

Lupinus arboreus, *L.* California.

Lyonia paniculata, *Nutt.* N. America.

Magnolia soulangeana, *Hort.* Garden origin.
tripetala, *L.* United States.

Menispermum canadense, *L.* N. America.

Menziesia globularis, *Salisb.* Alleghanies.

Microglossa albescens, *C. B. Clarke.* Himalaya.

Morus nigra, *L.* Temperate Asia.

Myrica californica, *Cham. & Schlecht.* California.
cerifera, *L.* United States.
Gale, *L.* N. Hemisphere.

Neillia amurensis, *Benth. & Hook.* Amurland.
opulifolia, *Benth. & Hook.* N. America.
thyrsiflora, *Don.* Himalaya.

Olearia Haastii, *Hook. f.* N. Zealand.

Ononis fruticosa, *L.* Europe.
rotundifolia, *L.* Europe.

Ostrya carpinifolia, *Scop.* S. Europe.

Paulownia imperialis, *Sieb. & Zucc.* Japan.

Pernettya mucronata, *Gaudich.* Chili, &c.

Petteria ramentacea, *Presl.* E. Europe.

Phellodendron japonicum, *Maxim.* Japan.

Philadelphus accuminatus, *Lange.* Origin uncertain.
coronarius, *L.* Asia.
— var. tomentosus, *Hook. f. & Thoms.* Himalaya, China.
gordonianus, *Lindl.* W. United States.
grandiflorus, *Willd.* S. United States.
hirsutus, *Nutt.* Oregon.
Keteleeri, *Hort.* Garden origin.
Lewisii, *Pursh.* W. N. America.
Satsumi, *Siebold.* Japan.

Photinia variabilis, *Hemsl.* China and Japan.

Picea Glehni, *F. Schmidt.* Saghalien.

Picris japonica, *D. Don.* Japan.
nitida, *Benth. & Hook. f.* S. United States.
ovalifolia, *D. Don.* Himalaya.

Pinus Cembra, *L* Europe.
ponderosa, *Dougl.* N.W. America.
tuberculata, *Gord.* Oregon.

Platanus occidentalis, *L.* N. America.

Populus deltoidea, *Marsh.* N. America.

Potentilla fruticosa, *L.* North hemisphere.
salesoviana, *Steph.* Siberia.

Prunus acida, *Borkh.* var. semperflorens.

Prunus—*cont.*
americana, *Marsh.* N. America.
Amygdalus, *Stokes.* Orient.
Armeniaca, *L.* N. China, &c.
Avium, *L.* Europe, &c.
Brigantiaca, *Chaix.* S.E. France.
Capollin, *Zucc.* Mexico, &c.
cerasifera, *Ehrh.* Caucasus. ?
communis, *Huds.* Europe, Asia.
grayana, *Maxim.* Japan.
humilis, *Bunge.* China.
Laurocerasus, *L.* var. colchica.
lusitanica, *L. f.* Portugal.
maritima, *Wangenh.* E. United States.
Maximowiczi, *Rupr.* Japan.
Mume, *S. & Z.* Japan.
Persica, *Stokes.* var. foliis rubris.
prostrata, *Labill.* Orient.
Puddum, *Roxb.* Himalaya.
pumila, *L.* N. America.
serotina, *Ehrh.* N. America.
tomentosa, *Thunb.* China, Japan.
virginiana, *L.* N. America.

Ptelea angustifolia, *Benth.* California, &c.
trifoliata, *L.* United States.
— var. glauca.

Pyrus americana, *DC.* N. America.
Aria, *L.* Europe, &c.
arbutifolia, *L.* N. America.
Aucuparia, *Gaertn.* Europe, &c.
auricularis, *Knoop.* Europe.
baccata, *L.* Asia.
betulaefolia, *Bunge.* Japan, &c.
communis, *L.* Europe, Asia.
coronaria, *L.* E. United States.
Cydonia, *L.* S. Europe, &c.
decaisneana, *Nichols.* Origin unknown.
floribunda, *Nichols.* Japan.
— var. Scheideckeri, *Hort.*
germanica, *Hook. f.* Europe, Asia.
intermedia, *Ehrh.* Europe.
japonica, *Thunb.* China, Japan.

Pyrus—*cont.*
lanata, *D. Don.* Himalaya.
lobata, *Nichols.* Caucasus.
Malus, *L.* Europe, &c.
Maulei, *Mast.* Japan.
Michauxi, *Bosc.* Asia ?
nigra, *Sargent.* N. America.
nivalis, *Jacq.* Levant, &c.
pinnatifida, *Ehrh.* Europe.
prunifolia, *Willd.* Siberia, &c.
Ringo, *Maxim.* Japan.
sikkimensis, *Hook. f.* India.
Sorbus, *Gaertn.* Europe.
spectabilis, *Ait.* China, Japan.
spuria, *DC.* Hybrid origin.
Toringo, *Sieb.* Japan.

Rhamnus Alaternus, *L.* Europe.
— var. angustifolius.
carolinianus, *Walt.* S. U. States.
catharticus, *L.* Europe, &c.
crenata, *Sieb. & Zucc.* Japan.
Frangula, *L.* Europe.
infectorius, *L.* Europe.
tinctorius, *Waldst. & Kit.* Europe, Asia.

Rhododendron Anthopogon, *D. Don.* Himalaya.
brachycarpum, *G. Don.* Japan.
campanulatum, *D. Don.* Himalaya.
caucasicum, *Pall.* Caucasus.
collettianum, *Aitch. & Hemsl.* Afghanistan.
ferrugineum, *L.* Europe.
myrtifolium, *Lodd.* Garden hybrid.
Ungerni, *Trautv.* Caucasus.
viscosum, *Torr.* N. America.

Rhodotypus kerrioides, *Sieb. & Zucc.* Japan.

Rhus Cotinus, *L.* Europe.
glabra, *L.* N. America.
integrifolia, *Benth. & Hook. f.* California.
ovata, *S. Wats.* California.
succedanea, *L.* China and Japan.
Toxicodendron, *L.* N. America, Japan.
trichocarpa, *Miq.* Japan.
typhina, *L.* N. America.

Ribes alpinum, *L.* Europe.
— var. pumilum, *Hort.*
aureum, *Pursh.* N.W. Amer.
— var. aurantiacum minus. *Hort.*
— var. praecox, *Lindl.*
— var. tenuiflorum, *Torr.*
cereum, *Dougl.* W. United States.
divaricatum, *Dougl.* W. N. America.
Grossularia, *L.* N. Hemisphere.
laxiflorum, *Pursh.* W. United States.
robustum, *Hort.*
sanguineum, *Pursh.* N.W. America.
— var. atrosanguineum, *Hort.*
— var. epruinosum, *K. Koch.*

Robinia Pseudacacia, *L.* E. United States.

Rosa acicularis, *Lindl.* Siberia, &c.
alba, *L.* Europe, &c.
alpina, *L.* Europe.
— var. pyrenaica, *Gouan.*
arkansana, *Porter.* United States.
beggeriana, *Schrenk.* Asia.
— var. Schrenki.
blanda, *Ait.* N. America.
canina, *L.* Europe, &c.
carolina, *L.* N. America.
damascena, *Mill.* E. Europe, &c.
Fendleri, *Crépin.* New Mexico.
ferruginea, *Vill.* Europe.
gallica, *L.* S. Europe.
hibernica, *Sm.* Britain.
lucida, *Ehrh.* N. America.
— var. grandiflora.
hispida, *Sims.* Garden origin.
humilis, *Marsh.* N. America.
involuta, *Sm.* var. Wilsoni, *Baker.*
Jundzilli, *Besser.* Europe.
Luciae, *Franch. & Rochebr.* Japan.
lutea, *Mill.* Orient.
macrophylla, *Lindl.* India.
Malyi, *Kerner.* Europe.
micrantha, *Sm.* Europe.

Rosa—*cont.*
microphylla, *Roxb.* China.
mollis, *Sm.* Europe.
moschata, *Mill.* India, &c.
multiflora, *Thunb.* Japan.
nitida, *Willd.* N. America.
nutkana, *Presl.* N. America.
pisocarpa, *A. Gray.* West. N. America.
pomifera, *Herrm.* Europe.
repens, *Scop.* Europe.
rubiginosa, *L.* Europe, &c.
rugosa, *S. & Z.* Japan.
sericea, *Lindl.* Himalaya.
spinosissima, *L.* Europe.
— var. altaica.
— var. fulgens, *Hort.*
— var. myriacantha.
— var. picta, *Hort.*
stylosa, *Desv.* Britain.
tomentosa, *Sm.* Europe.
webbiana, *Wall.* Himalaya.
wichuraiana, *Crépin.* Japan.

Rubus affinis, *Weihe & Nees.* Europe.
balfourianus, *Blox.* Europe.
Bellardii, *Weihe.* Europe.
caesius, *L.* Europe.
Colemani, *Blox.* Europe.
corylifolius, *Sm.* Europe.
cratægifolius, *Bunge.* N. Asia.
deliciosus, *James.* Rocky Mountains.
dumetorum, *W. & N.* Europe.
echinatus, *Lindl.* Britain.
exsecatus, *Muell.* Europe.
foliolosis, *D. Don.* Himalaya.
fuscus, *Weihe & Nees.* Europe.
glandulosus, *Bell.* Europe.
hystrix, *Weihe & Nees.* Europe.
Koehleri, *W. & N.* Europe.
laciniatus, *Willd.*
lasiostylus, *Focke.* China.
leucodermis, *Dougl.* North America.
leucostachys, *Sm.* Europe.
lindleyanus, *Lees.* Britain.
longithyrsiger, *Lees.* Britain.
macrophyllus, *W. & N.* Europe.
melanolasius, *Focke.* N. Amer.
neglectus, *Peck.* North America.
niveus, *Wall.* Himalaya.

Rubus—*cont.*
mucronatus, *Blox.* Britain.
nutkanus, *Moç.* W.N. America.
occidentalis, *L.* N. W. America.
parvifolius, *L.* China and Japan.
phoenicolasius, *Maxim.* China, Japan.
pubescens, *Auct. Angl.* Britain.
Radula, *Weihe.* Europe.
ramosus, *Blox.* Britain.
rhamnifolius, *W. & N.* Europe.
scaber, *Weihe & Nees.* Europe.
spectabilis, *Pursh.* North America.
Sprengelii, *Weihe & Nees.* Europe.
suberectus, *Anders.* Europe.
villicaulis, *W. & N.* Europe.
villosus, *Ait.* N. America.
xanthocarpus, *Franch.* China.

Ruta graveolens, *L.* Europe.

Sambucus glauca, *Nutt.* West N. America.
nigra, *L.* Europe, &c.
— var. swindonensis, *Hort.*
— var. virescens, *Hort.*
racemosa, *L.* North. hemisphere.
— var. serratifolia.

Santolina viridis, *Willd.* Europe.

Schizandra chinensis, *Baill.* China, &c.

Skimmia Fortunei, *Mast.* (S. japonica, *Hort.*) China.

Smilax rotundifolia, *L.* N. America.

Sophora alopecuroides, *L.* Asia Minor, &c.

Spartium junceum, *L.* S. Europe.

Spiraea assimilis *Zabel.* Garden origin.
betulifolia, *Pall.* N. America.
bracteata, *Zabel.* Japan.
canescens, *D. Don.* Himalaya.
discolor, *Pursh.* N. W. America.
Douglasii, *Hook.* N. W America.

Spiraea—*cont.*
japonica, *L. f.* Japan.
— var. glabrata, *Nichols.*
lindleyana, *Wall.* Himalaya.
Margaritae, *Zabel.* Garden origin.
nobleana, *Hook.* California.
notha, *Zabel.* Garden origin.
salicifolia, *L.* E. Europe to Japan.
sorbifolia, *L.* N. Asia.
tomentosa, *L.* United States.

Staphylea Bumalda, *S. & Z.* Japan.
colchica, *Stev.* Caucasus.
pinnata, *L.* Europe.

Symphoricarpus Heyeri, *Dippel.* W. United States.
mollis, *Nutt.* var. ciliatus, *Nutt.*
orbiculatus, *Moench.* N. America.
racemosus, *Michx.* N. America.
rotundifolius, *A. Gray.* W. United States.

Syringa Emodi, *Wall.* Himalaya.
japonica, *Decne.* Japan.
pekinensis, *Rupr.* China.
persica, *L.* Afghanistan.

Tamarix chinensis, *Lour.* China.
gallica, *L.* Europe.
tetrandra, *Pall.* E. Europe.

Taxus baccata, *L.* Europe, &c.
cuspidata, *S. & Z.* Japan.

Tecoma radicans, *Juss.* N. America.

Thuja gigantea, *Nutt.* W. N. America.
— var. plicata, *Donn.*
japonica, *Maxim.* Japan.
occidentalis, *L.* N. America.
— var. Dicksoni.
orientalis, *L.* China and Japan.

Tilia argentea, *Desf.* Europe.
cordata, *Mill.* Europe, Asia.
petiolaris, *DC.* Europe.
platyphyllus, *Scop.* Europe.

Tsuga Sieboldi, *Carr.* Japan.

Ulex europaeus, *L.* Europe.

Ulmus campestris, *L.* Europe, &c.

Umbellularia californica, *Nutt.* California.

Vaccinium Arctostaphylos, *L.* Caucasus, &c.
corymbosum, *L.* N. America.
— var. amœnum, *A. Gray.*
erythrocarpum, *Michx.* S. E. United States.
hirsutum, *Buckl.* N. Carolina.
ovatum, *Pursh.* W. N. America.
padifolium, *Sm.* Madeira.
pensylvanicum, *Lam.* N. America.
stamineum, *L.* E. United States.

Viburnum acerifolium, *L.* N. United States.
cassinoides, *L.* N. America.
dentatum, *L.* N. America.
— var. montanum.
hanceanum, *Maxim.* China.
Lantana, *L.* Europe.
molle, *Michx.* N. America.
Opulus, *L.* Europe, &c.
prunifolium, *L.* N. America.

Vitis Coignetiæ, *Pull. & Planch.* Japan.
heterophylla, *Thunb.* Japan.
lanata, *Roxb.* Himalaya, &c.
rumicisperma, *M. Laws.* Himalaya.

Widdringtonia Whytei, *Rendle.* Central Africa.

Yucca macrocarpa, *Engelm.* Arizona.
Whipplei, *Torr.* California.

Zanthoxylum Bungei, *Planch.* China.

Zelkowa acuminata, *Planch.* Japan.

Zenobia speciosa, *D. Don.* S. E. United States.
— var. pulverulenta.

ROYAL GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

APPENDIX II.—1897.

NEW GARDEN PLANTS OF THE YEAR 1896.

The number of garden plants annually described in botanical and horticultural publications, both English and foreign, is now so considerable that it has been thought desirable to publish a complete list of them in the *Kew Bulletin* each year. The following list comprises all the new introductions recorded during 1896. These lists are indispensable to the maintenance of a correct nomenclature, especially in the smaller botanical establishments in correspondence with Kew, which are, as a rule, only scantily provided with horticultural periodicals. Such a list will also afford information respecting new plants under cultivation at this establishment, many of which will be distributed from it in the regular course of exchange with other botanic gardens.

The present list includes not only plants brought into cultivation for the first time during 1896, but the most noteworthy of those which have been re-introduced after being lost from cultivation. Other plants included in the list may have been in gardens for several years, but either were not described or their names had not been authenticated until recently.

In addition to species and botanical varieties, all hybrids, whether introduced or of garden origin, with botanical names, and described for the first time in 1896, are included. It has not been thought desirable, however, to give authorities after the names of garden hybrids in such genera as *Cypripedium*, &c. Mere garden varieties of such plants as *Coleus*, *Codiæum* or *Narcissus* are omitted for obvious reasons.

In every case the plant is cited under its published name, although some of the names are doubtfully correct. Where, however, a correction has appeared desirable, this is made.

The name of the person in whose collection the plant was first noticed or described is given where known.

An asterisk is prefixed to all those plants of which examples are in cultivation at Kew.

The publications from which this list is compiled, with the abbreviation used to indicate them, are as follows:—*B. B.*—Bulletin de L'Herbier Boissier. *B. H. N.*—Bulletin du Museum d'histoire naturelle, Paris. *B. M.*—Botanical Magazine. *Bruant Cat.*—Bruant's Catalogue

U 96558. 1375.—4/97. Wt. 123. A

of New Plants, 1896. *B. T. O.*—Bulletino della R. Società Toscana di Orticultura. *Bull Cat.*—Bull, Catalogue of New, Beautiful, and Rare Plants. *Gard.*—The Garden. *G. C.*—Gardeners' Chronicle. *G. and F.*—Garden and Forest. *Gfl.*—Gartenflora. *G. M.*—Gardeners' Magazine. *Ill. H.*—L'Illustration Horticole. *Jard.*—Le Jardin. *J. of H.*—Journal of Horticulture. *J. H. F.*—Journal de la Société nationale d'horticulture de France. *J. O.*—Journal des Orchidées. *K. B.*—Bulletin of Miscellaneous Information, Royal Gardens, Kew. *L.*—Lindenia. *Lem. Cat.*—Lemoine, Plantes Nouvelles. *Lind. Cat.*—L'Horticulture Internationale, Catalogue. *M. D. G.*—Mitteilungen der Deutschen Dendrologischen Gesellschaft. *M. G. Z.*—Möller's Deutsche Gärtner-Zeitung. *M. K.*—Monatsschrift für Kakteenkunde. *N. B.*—Notizblatt des Königl. botanischen Garten und Museums zu Berlin. *N. G. M.*—Dr. Neubert's Garten-Magazin. *O. R.*—Orchid Review. *R. H.*—Revue Horticole. *R. H. B.*—Revue de l'Horticulture Belge. *Sand. Cat.*—Sanders' Catalogue of New Plants, 1895. *Spaeth Cat.*—L. Spaeth, General Nursery Catalogue. *Veitch Cat.*—Veitch & Sons, Catalogue of Plants. *W. G.*—Wiener Illustrirte Garten-Zeitung.

The abbreviations in the descriptions of the plants are:—*ft.*—Foot or Feet. *G.*—Greenhouse.—*H.* Hardy. *H. H.*—Half-hardy. *in.*—Inches. *S.*—Stove.

Abies grandis pendula. (*M. D. G.* 1896, 28.) Coniferæ. H. A weeping form. Originated in nursery of L. Späth, Berlin.

Acalypha Sanderi, N. E. Brown. (*G. C.* 1896, xx., 392.) Urticaceæ. S. A new species attaining a height of 10 to 15 ft. with large ovate green serrated leaves and long drooping tail-like spikes of bright rose red flowers. New Guinea. (F. Sander & Co.)

Acanthophippium eburneum, Kränzl. (*G. C.* 1896, xx., 266.) Orchideæ. S. A new species affined to *A. Curtisii*. Pseudobulbs angular, 2 to 3 in. long, purplish; leaves oblong lanceolate, plicate, 8 in. long, 2 in. wide; scape two flowered; flowers nearly 2 in. long, white. Malaya? (P. Wolter, Magdeburg.)

Acanthophippium mantinianum. *L.* Lind. & Cogn. (*J. O.* 1896, 138; *L.* 1896, t. 536.) S. A near ally of *A. bicolor*, but differing in its much more robust habit and in the colour of the flowers. Sepals yellow slightly shaded with green, spotted and blotched with purple; petals like sepals but lower portion whiter; lip waxy white, thickened part of disk orange yellow with ridges spotted and lined with purple. Phillipines. (L'Horticulture Internationale, Brussels.)

Acer campestre, var. **postelense,** R. Lauche. (*M. D. G.* 1896, 80.) Sapindaceæ. H. A yellow-leaved form of the common maple.

Acer Duretti aureo-marginatum. (*M. D. G.* 1896, 79.) H. A form with leaves margined and dotted with yellow.

Acer Ginnala, Maxim. (*M. D. G.* 1896, 79.) H. The two following varieties of this species are described by Count Schwerin; the names are descriptive enough:—*angustilobum*, *pulverulentum*.

Acer Negundo varieties. (*M. D. G.* 1896, 78.) H. The following forms of this species are described and figured, viz.:—*densiflorum*, *falcatum*, *koehneanum*, *parallelum*, *rectangulatum*.

Acer Negundo boreale. (*M. D. G.* 1896, 2.) H. Said to have been introduced from Canada and to be hardy in Russia, and to ripen seeds where the form usually grown in Europe is killed by cold. (H. Schroeder, Moscow.)

Acer Negundo odessanum. (*M. D. G.* 1896, 2.) H. A form with leaves of a deeper golden colour and retaining that colour longer than the ordinary golden *Acer Negundo*. (T. Rothe, Odessa.)

Acer platanoides, var. **multicolor.** (*Gfl.* 1886, 219.) H. A form of the Norway Maple with large red leaves later showing yellowish-white specks and blotches.

***Adiantum bessonianum.** (*G. C.* 1896, xx., 75; *G. and F.* 1896, 314.) Filices. S. A variety of *A. tenerum* with crowded imbricating reniform pinnæ. West Indies. (J. O'Brien.)

***Adonis amurensis,** Regel & Radde. (*G. C.* 1896, xix., 240.) Ranunculaceæ. H. A pretty plant with much divided leaves and yellow flowers about 2 in. in diameter. North China. (Kew.)

Aerides Fieldingi album. (*L.* 1896, t. 538.) Orchideæ. S. A form differing from the type in having entirely white flowers. (M. Fl. Pauwels, Deurne, Belgium.)

***Agave laxifolia,** Baker. (*B. M.* t. 7477.) Amaryllideæ. G. A species of the section *Rigidæ* near *A. excelsa*. The flowers give out a smell exactly like that of mice. Mexico. (Kew.)

***Akebia lobata,** Dcne. (*B. M.* t. 7485.) Berberideæ. H. This differs from *A. quinata* in having more woody branches, and trifoliate leaves with broad lobulate very pale green more membranous leaflets, the flowers too are smaller, though of the same structure and colour. Japan, North China. (Kew.)

Alocasia sanderiana gandavensis. (*Ill. H.* 1896, 267, t. 65.) Aroideæ. S. A form with young leaves of purplish ground colour and vermilion-tinted veins; this coloration remains constant on the under surface but gradually changes to green on the upper surface. (Louis De Smet-Duvivier, Ghent.)

Aloe abyssinica, Lam. (*W. G.* 1896, 102.) Liliaceæ. G. The following varieties are described by C. Sprenger: *erecta, glauca, robusta, recurvata, pygmæa, maculata.* (Dammann & Co., Naples.)

Aloe Bedinghausii. (*M. K.* 1896, 24.) G. A garden hybrid between *Gasteria nigricans* and *Aloe longiaristata.* (Haage & Schmidt, Erfurt.)

***Aloe Beguinii.** (*M. K.* 1896, 24.) G. A garden hybrid between *Gasteria verrucosa* and *Aloe longiaristata.* (Haage & Schmidt, Erfurt.)

Aloe Chludowii. (*M. K.* 1896, 24.) G. A garden hybrid, whose parents are given as probably *Gasteria scaberrima* and *G. verrucosa.* (Haage & Schmidt, Erfurt.)

Aloe cyanea. (*M. K.* 1896, 24.) G. A garden hybrid between *A. glauca* and *A. incana.* (Haage & Schmit, Erfurt.)

Aloe de Laetii. (*M. K.* 1896, 24.) G. A garden hybrid between *A. ciliaris* and *A. soccotrina.* (Haage & Schmidt, Erfurt.)

Aloe Holtzei. (*M. K.* 1869, 24.) G. A garden hybrid whose probable parents are given as *Gasteria intermedia* and *Haworthia Radula.* (Haage & Schmidt, Erfurt.)

Aloe Hoyeri. (*M. K.* 1896, 24.) G. A garden hybrid between *Aloe serrata* and *Lomatophyllum borbonicum.* (Haage & Schmidt, Erfurt.)

Aloe hybrida gloriosa. (*M. K.* 1896, 27.) G. A garden hybrid between *Lomatophyllum borbonicum* and *Gasteria maculata.* (Haage & Schmidt, Erfurt.)

Aloe Lapaixii. (*M. K.* 1896, 27.) G. A garden hybrid between *Gasteria maculata* and *Aloe longiaristata.* (Haage & Schmidt, Erfurt.)

Aloe Lauchei. (*M. K.* 1896, 27.) G. A garden hybrid between *Gasteria pulchra* and *G. scaberrima.* (Haage & Schmidt, Erfurt.)

Aloe Nowotnyi. (*M. K.* 1896, 27.) G. A garden hybrid of which *A. longiaristata* is one of the parents. (Haage & Schmidt, Erfurt.)

Aloe Quehlii. (*M. K.* 1896, 27.) G. A garden hybrid between *Gasteria maculata* and *G. formosa.* (Haage & Schmidt, Erfurt.)

Amaranthus Dussii, Sprenger. (*B. T. O.* 1896, 178.) Amarantaceæ. H. A handsome annual with brightly-coloured leaves and flowers. Perhaps a variety of *A. spinosus.* West Indies. (Dammann & Co., Naples.)

Amaranthus superbus. (*Ill. H.* 1896, 141, f. 15.) H. H. Probably a variety of *A. melancholicus* with elliptic leaves blood-red above and crimson beneath. (Dammann & Co., Naples.)

Anchusa affinis, *R. Br.* (*B. T. O.* 1896, 220, f. 12.) Boragineæ. H. A handsome annual or perennial with large forget-me-not-like flowers. Abyssinia. (Dammann & Co., Naples.)

Angraecum Fournieræ, Ed. André. Orchideæ. (*R. H.* 1896, 256, f.; *O. R.* 1896, 196.) A synonym of *A. stylosum,* Rolfe. (*K. B.* 1895, 194.)

Anthurium pumilum. (*G. C.* 1896, xix., 401.) Aroideæ. S. A garden seedling or hybrid; parentage not stated. (Sir Trevor Lawrence.)

Anthurium triumphans. (*G. C.* 1896, xix., 650.) S. A seedling or garden hybrid with pink spathe and yellow spadix. (J. Laing & Sons.)

Aralia chinensis foliis aureo variegatis. (*M. G. Z.* 1896, 323.) Araliaceæ. H. A form with golden variegated leaves. (Peter Smith & Co., Bergedorf, Germany.)

Arctostaphylos nevadensis. A. Gray. (*M. D. G.* 1896, 18.) Ericaceæ. H. A prostrate evergreen bush with ovate leathery leaves and short racemes of reddish flowers. Sierra Nevada.

Artemisia frigida, Willd. (*M. D. G.* 1896, 25). Compositæ. H. A small bush, herbaceous from a suffrutescent base, with finely cut silvery-gray leaves. North Asia. N. W. America. (L. Späth, Berlin.)

Aspidium cristatum × marginale. (*G. and F.* 1896, 444, f. 58.) Filices. H. A supposed natural hybrid between the two species indicated in the name. Massachusetts. (G. E. Davenport, Medford, Mass., U.S.A.)

Aspidium simulatum, Davenport. (*G. and F.* 1896, 484, f. 69.) H. A new species allied to *A. Thelypteris,* which it resembles in general characters differing chiefly in its longer stipe, introrse lower pinnæ, larger sori and less convolute margins. Missouri. (G. E. Davenport, Medford, Mass., U.S.A.)

Asplenium Herbstii. (*G. C.* 1896, xx., 470.) Filices. H. "Fronds very foliaceous and a bright olive-green colour." Origin not stated. (H. B. May.)

Aster Vilmorini, Franch. (*J. H. F.* 1896, 1188.) Compositæ. H. A species remarkable for its large flower-heads with ray-florets of a bluish-purple colour, either solitary or in pairs at the top of a long naked stalk. Western China. (M. Maurice de Vilmorin, France.)

Astragalus gilgianus, Graebner. (*N. B.* 1896, 185.) Leguminosæ. H. A perennial with silvery leaves and deep ray-violet flowers. Nearly related to *A. cretaceus, A. oxytropifolius* and *A. eriophyllus.* Asia Minor. (Berlin B. G.)

Baccharis trimera, DC. (*R. H.* 1896, 152, ff., 50–2.) Compositæ. G. A leafless shrub attaining a height of 6 ft. with winged expansions along the stems. Flower-heads small, inconspicuous. Argentina. (Ed. André, France.)

Begonia acerifolia. (*Veitch Cat.* 1896, 51.) Begoniaceæ. A garden hybrid between *B. Burkei* and *B decora.* (J. Veitch & Sons.) [There is a species called *acerifolia,* H. B. K., native of Ecuador.]

***Begonia carminata.** (*Veitch. Cat.* 1896, 2.) G. A garden hybrid between *B. coccinea* and *B Dregei.* (J. Veitch & Sons.)

***Begonia odoratissima,** Lemoine. (*Lem. Cat.* 1896, 49.) A race of tuberous rooted Begonias with fragrant flowers. (V. Lemoine & Son, Nancy.)

Begonia Rex × decora. (*Jard.* 1896, 267, f. 123.) S. A series of hybrids raised from the two parents above-mentioned is described. (MM. Cappe, France.)

***Begonia umbraculifera,** Hook f. (*B. M.* t. 7457.) S. A remarkable plant both in habit and in having hermaphrodite flowers. A tall species with alternate large reniform or peltate leaves and crowded corymbs of chiefly male white flowers with a few female and bisexual ones. Brazil. (F. Sander & Co.)

Berberis pruinosa, Franchet. (*G. and F.* 1896, 67.) Berberideæ. H. A dwarf shrub "the new growth, the underside of the leaves and the abundant berries being all pure white, and the flowers sulphur yellow." Yunnan.

Bertonerila. (*Lind. Cat.* 1896, 7, ff.) Melastomaceæ. Several varieties of a hybrid between *Bertolonia* and *Sonerila* are here described and figured. (L'Horticulture Internationale, Brussels.)

Billbergia Binoti, R. Gérard. (*J. H. F.* 1896, 724.) Bromeliaceæ. S. A species near *B. speciosa,* Thunb. Leaves in a rosette, deep green above, lower portion tinted with reddish-purple, under surface light green lined with white. Inflorescence pendulous, stem, bracts, &c. red. Organ Mountains, Brazil. (Lyons B. G.)

***Bocconia microcarpa,** Maxim. (*Gard.* 1896, L., 197.) Papaveraceæ. H. A handsome species attaining the height of 9 ft. The inflorescence forms a plume-like panicle, not unlike the Venetian Sumach. N. China. (Kew.)

Brodiæa ixioides erecta. (*Gard.* 1896, xlix., 454.) Liliaceæ. A form with large trusses of bright yellow flowers. (Wallace & Son.)

Brodiæa Orcuttii, Baker. (*G. C.* 1896, xx., 214, f. 40.) H. A bulb bearing umbels of 5–15 bright lilac flowers on a scape 1 ft. long. San Diego Country. (Wallace & Son.)

***Bryanthus Breweri,** A. Gray. (*M. D. G.* 1896, 19.) Ericaceæ. H. A

charming dwarf evergreen shrub with crowded narrow leaves, and short racemes of purple-red flowers. California.

Bulbophyllum attenuatum, Rolfe. (*K. B.* 1896, 45.) Orchideæ. S. A new species with a flower scape 9 in. long, bearing flowers an inch across and coloured purple. Borneo. (L'Horticulture Internationale, Brussels.)

***Bulbophyllum longiscapum,** Rolfe. (*K. B.* 1896, 45.) S. A new species with ovoid pseudobulbs an inch long, linear oblong leaves 4 in. long, scapes over a foot long and flowers an inch across coloured light green with a red-purple lip. Fiji. (Kew.)

Bulbophyllum orthoglossum, Wendl. & Kränzl. (*G. C.* 1896, xix., 326.) S. A new species allied to *B. mandibulare*, which it resembles in pseudobulbs, leaves and flowers, but they are only half as large. The flowers are yellowish green with brown stripes, the lip purple. Saranga Island. (Herrenhausen.)

Bulbophyllum tremulum, Wight. (*G. C.* 1896, xix., 593.) G. Pseudobulbs subglobose, leaf ovate-lanceolate 2 in. long; raceme 6 in. long bearing a few flowers $1\frac{1}{2}$ in. diameter white with red-purple lines and lip, the latter fringed with long hairs. Nilghiri Hills. (C. J. Lucas.)

***Caesalpinia bicolor,** C. H. Wright. (*K. B.* 1896, 22, 223.) Leguminosæ. S. A new species, forming a tree 20 ft. high; the branches thorny, the leaves bipinnate, the flowers red-purple, and the fruit a flat broad pod 2 in. long. Yields a very fine Brazil-wood, valuable for dye purposes. South America. (Kew.)

Calanthe albata. (*G. C.* 1896, xx., 602.) Orchideæ. S. A garden hybrid between *C. veratrifolia* and *C. Cooksoni*. (F. Sander & Co.)

Calanthe Cooksonii. (*Sand. Cat.* 1896, 3.) S. A garden hybrid with white flowers; parentage not stated. (F. Sander & Co.)

***Calochortus nitidus,** Dougl. (*Gard.* 1896, L., 11.) Liliaceæ. H. A distinct species, mauve in colour with a white flush, and a blotch of indigo blue on each segment; bearded at the base. California. (Wallace & Son.)

Campanula balchinensis. (*Gard.* 1896, L., 217.) Campanulaceæ. H. A garden hybrid between *C. fragilis* and *C. isophylla alba*. (Balchin & Sons.)

***Campanula regina,** Alboff. (*G. C.* 1896, xix., 648.) [This is *C. mirabilis*, Alboff.]

Carrieria calycina, Franch. (*R. H.* 1896, 497, f. 170.) Bixineæ. H. A tree attaining a height of about 50 ft., with the general aspect of *Idesia polycarpa*, but with a woody capsular fruit. China. (Paris B. G.)

Catasetum semiroseum, G. Beck. (*W. G.* 1896, 424, t. 4.) Orchideæ. S. Petals and sepals whitish or bright red; lip greenish white, carmine-coloured at the base. One of the numerous varieties of the natural hybrid *C. splendens*, Cogn.

***Catasetum splendens,** Cogn. (*L.* 1896, tt. 502–3.) S. A number of forms of this natural hybrid are figured in above work under the following names: *rubrum, macrocarpum luteo-roseum, albo-purpureum, acutipetalum.* (L'Horticulture Internationale, Brussels.)

Catasetum splendens aureo-maculatum. (*Ill. H.* 1896, 91, t. 54.) S. A form with yellow flowers spotted with rich red-brown. (L'Horticulture Internationale, Brussels.)

Cattleya bicolor Lewisii. (*G. C.* 1896, xx., 310.) Orchideæ. G. A variety with emerald green sepals and petals and white lip stained with deep purple. (E. Ashworth.)

Cattleya granulosa Banneri. (*O. R.* 1896, 244.) G. A variety with the sepals and petals suffused with bright lurid purple, the flower measuring 6 in. across. (S. Banner.)

Cattleya intermedio - Loddigesii (*G. C.* 1896, xix., 593.) G. A supposed natural hybrid between the two species indicated in the name. (Hon. W. Rothschild.)

Cattleya intermedio-flava. (*R. H.* 1896, 549.) G. A garden hybrid between *Cattleya intermedia* and *Laelia flava*. (M. L. Fournier, Marseilles.)

Cattleya lauremossiæ. (*G. C.* 1896, xix., 468.) G. A garden hybrid between *C. lawrenciana* and *C. Mossiæ*. (R. B. White.)

Cattleya luddemanniana Ernstii. (*G. C.* 1896, xix., 655.) Flowers larger and richer in colour than those of the type. (H. S. Leon.)

Cattleya Mathoniæ, L. Lind. (*L.* 1896, t. 539.) A supposed natural hybrid between *C. Mossiæ* and *C. luddemanniana.* (L. Linden & Co., Moortebeek, Belgium.)

Cattleya maxima floribunda. (*L.* 1896, t. 566.) A fine form with bright rose-coloured flowers, lip crimson purple with crisped edges margined with white. (L'Horticulture Internationale, Brussels.)

Cattleya Mendelii balliana. (*Sand. Cat.* 1896, 5.) G. Remarkable for the large size and rich colour of the flowers. (F. Sander & Co.)

Cattleya super-Forbesi. (*G. C.* 1896, xx., 90.) G. A garden hybrid between *C. superba* and *C. Forbesii.* (J. Cypher.)

Cattleya Trianæ. (*L.* 1896, tt. 530-1.) A series of varieties are figured and described; *festiva, regalis, dulcis, amplissima, superba, ardens, splendens, majestica.* (L. Linden & Co., Mortebeek, Belgium.)

Cattleya Trianæ atrata. (*J. O.* 1896, 40.) A form with large flowers; sepals and petals very pale rose, the rounded lip very deeply coloured. (L'Horticulture Internationale, Brussels.)

***Celmisia Munroi,** Hook. f. (*B. M.* t. 7496.) Compositæ. G. Whole plant except the upper surface of the leaves and florets, clothed with a snow-white cottony appressed wool. Stem short, crowned with a thick mass of erect and recurved linear-lanceolate leaves. Scapes erect, one-flowered. Head one to two and a half inches across, disc-florets golden yellow, ray-florets white. New Zealand. (J. Veitch & Sons.)

Chamædorea gratissima, L. Lind. (*Lind. Cat.* 1896, 13.) Palmæ. S. Described as an elegant species of robust habit with large leaves resembling those of *C. Verschaffeltii.* Habitat not given. (L'Horticulture Internationale, Brussels.)

***Chirita hamosa,** C. B. Clarke. (*R. H.* 1896, 184, t.) Gesneraceæ. S. An interesting species with peduncle adnate to the leaf-stalk. Flowers lilac blue, showy. India. (J. Sallier, Paris.)

Cirrhopetalum graveolens, Bailey. (*O. R.* 1896, 308.) Orchideæ. S. A large flowered species with leaves 12 in. by 5 in., scapes 6 in. high, raceme 7 in. across, composed of about 13 strongly-scented flowers, yellowish-green speckled with red, lip reddish-brown changing to deep purple. New Guinea. (Brisbane Bot. Gard.) [This is supposed to be identical with *C. robustum*, Rolfe.]

Cirsium Velenovskyi, Hort. (*W. G.* 1896, 76, ff. 6, 7.) Compositæ. H. A biennial, during first year with leaves extremely like those of *Chamaepeuce diacantha.* The second year the flowering stems develop to a height of 4½ ft. and bear numerous large beautiful red flower-heads. Origin not stated. (V. Mašek, Bohemia.)

Clematis Addisonii, Britton. (*G. and F.* 1896, 324, f. 43.) Ranunculaceæ. H. A near ally of *C. Viorna*: sepals dark violet-purple, except at the acute reflexed yellow tips. Alleghany Mountains. (Professor C. S. Sargent, Brookline, Mass., U.S.A.)

Clematis Suksdorfii, Robinson. (*G. and F.* 1896, 255, f. 36.) H. "This little-known Clematis of the Flammula section resembles in habit and foliage the widely distributed and variable *C. ligusticifolia.*" N. West. United States.

***Cœlogyne balfouriana.** (*Sand. Cat.* 1896, 6.) Orchideæ. G. Described as a free flowering and distinct species, the flowers being coloured cinnamon, orange, and white, and borne on long arched spikes. Habitat not stated. (F. Sander & Co.)

Cœlogyne lauterbachiana, Kränzl. (*N. B.* 1896, 113.) S. A species allied to *C. carnea*, but differing in having more than one leaf to a bulb, in the form of the lip and in the shorter inflorescence. New Guinea. (Berlin, B. G.)

Cœlogyne lurida, L. Lind. & Cogn. (*L.* 1896, 80; t. 532.) S. Sepals and petals a rather greenish-yellow tinged with purple, lip 3-lobed, white and purplish. Origin not stated. (L'Horticulture Internationale, Brussels.)

Cœlogyne virginalis, L. Lind. (*G. and F.* 1896, 144.) S. A provisional name for an imported plant described as having pure white flowers in the way of *C. cristata*, and deliciously fragrant. Habitat not recorded. (L'Horticulture Internationale, Brussels.)

***Coffea stenophylla,** G. Don. (*B. M.* t. 7475.) Rubiaceæ. S. "An interesting plant, one of the two indigenous West African species which, in point of commercial value, may prove a formidable rival of the Arabian." Sierra Leone. (Kew.)

***Colchicum byzantinum** var. **cilicum.** (*Gfl.* 1896, 172.) Liliaceæ. H. A handsome variety with flowers as

large as those of *C. speciosum*. Asia Minor. (Kew.)

Colchicum fascicularis, L. (*Gard.* 1896, xlix., 89.) H. The foliage and flowers of this species appear together, the latter being crocus-like in shape and pink and white in colour. Greece. (T. Smith, Newry.)

Coleus spicatus Rondinella. (*Gfl.* 1896, 358, f. 62.) Labiatæ. G. A bushy herbaceous plant about 8 in. high, with fleshy leaves and racemes of blue flowers. Abyssinia. (Dammann & Co., Naples.)

Colutea longialata, Koehne. (*M. D. G.* 1896, 49.) Leguminosæ. H. A species nearly related to *C. arborescens*. Probably a native of the Balkan Peninsula or Asia Minor. (L. Späth, Berlin.)

***Comanthosphace japonica**, S. Moore. (*B. M.* t. 7463.) Labiatæ. H. A small undershrub with hoary branches, ovate-lanceolate dark green leaves and erect terminal spikes of small yellow flowers with long exserted stamens. Japan. (Arnold Arboretum.)

***Coriaria japonica**, A. Gray. (*B. M.* t. 7509.) Coriarieæ. H. The most interesting feature of this Coriaria is the colour of the flowering and fruiting petals, which varies from cherry- to coral-red, that of all other known species being black or violet-black. Japan. (Arnold Arboretum.)

Cornus alba Rosenthali. (*M. D. G.* 1897.) Cornaceæ. A form with variegation similar to C. Spaethii. (H. Albern, Vienna.)

***Cornus corynostylis**, Koehne. (*Gfl.* 1896, 286.) H. A Himalayan species nearly allied to *C. macrophylla*, Wall.

***Coronilla cappadocica**, Willd. *Gard.* 1896, L., 117.) Leguminosæ. H. A species of prostrate habit. Flowers golden yellow in numerous racemes. Asia Minor. (E. Whittall, Smyrna.)

Cotyledon Purpusii, K. Schumann. (*N. B.* 1896, 161.) Crassulaceæ. H. Nearly allied to *Echeveria farinosa*, but differing in the narrow, angled, pyramid-formed, red not yellow corollas. Sierra Nevada. (Ernest Bernary, Erfurt.)

***Crassula aloides**, N. E. Br. (*K. B.* 1896, 161.) Crassulaceæ. S. A new species with the appearance of an Aloe, the leaves being green, fleshy, a foot or more long, 2 in. wide at the base. The flower-scape is 3-4 ft. high bearing a corymb 18 in. across of small pale yellow flowers. Transvaal. (Kew.)

Crinum Lesemanni, G. Beck. (*W. G.* 1896, 125, t. 1.) Amaryllideæ. H. H. A garden hybrid between *C. longiflorum* and *C. Moorei* (*makoyanum*). Identical with *C. Powellii*, a hybrid of the same parentage. (H. Lesemann, Vienna.)

Cucurbita andreana, Naudin. (*R. H.* 1896, 542, ff. 184-7.) Cucurbitaceæ. G. A new species with long stems rooting at the nodes, large leaves marbled with white, flowers only half the size of those of the common pumpkin, and obovoid fruit marked with white and yellow on a green ground. Uruguay. (Ed. André, France.)

Cupressus goweniana compacta, Ed. André. (*R. H.* 1896, 8, f. 1.) Coniferæ. H. H. A form differing from the type in its dense, compact, pyramidal habit. (M. Allard, Angers.)

Cymbidium Lowio - eburneum. (*G. C.* 1896, xix., 337.) Orchideæ. G. A garden hybrid between the species indicated in the name. The reverse cross (*eburneo-lowianum*) was raised by Messrs. J. Veitch & Sons in 1889.

Cypripedium Argo-Stonei. (*G. C.* 1896, xx., 554.) Orchideæ. A garden hybrid between the two species indicated by the name. (N. C. Cookson.)

Cypripedium Chapmani. (*G. C.* 1896, xx., 667.) A garden hybrid between *C. Curtisii* and *C. bellatulum*. (N. C. Cookson.)

Cypripedium concolor var. **longipetalum**, Rolfe. (*O. R.* 1896, 54.) A variety with petals 2½ in. long. (R. B. White.)

Cypripedium goultenianum. (*Sand. Cat.* 1896, 23.) A garden hybrid between *C. Curtisii* and *C. callosum*. (F. Sander & Co.)

Cypripedium insigne, Wall. (*L.* 1896, t. 510.) The following varieties are figured in work just mentioned: *moortebeekiense*, *miniatum*, *latimaculatum*, *lucidum*, *rubidum*, *albo-marginatum*. (L'Horticulture Internationale, Brussels.)

Cypripedium insigne Luciani. (*L.* 1896, t. 505; *Ill. H.* 1896, 11, t. 49.) G. A form with yellow lip and petals; upper sepals broadly margined with white. (L'Horticulture Internationale, Brussels.)

Cypripedium lawrencianum var. viride, L. Lind. (*L.* 1896, t. 546.) A variety with flowers much greener than the type. (L'Horticulture Internationale, Brussels.)

Cypripedium Lawrenceo-Regnieri. (*L.* t. 504.) A garden hybrid between the two species indicated by the name. (M. Bleu, Paris.)

Cypripedium palatinum. (*W. G.* 1896, 105.) A garden hybrid between *C. spicerianum* and *C. harrisianum.*

Cypripedium Reginæ. (*G. C.* 1896, xx., 534.) A garden hybrid between *C. leeanum* and *C. fairieanum.* (J. Veitch & Sons.)

Cypripedium regnaldianum. (*Sand. Cat.* 1896, 24.) A garden hybrid between *C. insigne* and *C. callosum.* (F. Sander & Co.)

Cypripedium rothwellianum. (*G. C.* 1896, xx., 310.) A garden hybrid between *C. Stonei* and *C. Argus.* (F. Sander & Co.)

Cypripedium Sanderæ, Sander. (*G. and F.* 1896, 144.) A provisional name for an imported plant described as having a large spear-shaped dorsal sepal coloured crimson, yellow and green, broad petals coloured yellow and red, and a long narrow yellow pouch. Habitat not stated. (F. Sander & Co.)

Cypripedium schofieldianum. (*G. M.* 1896, 283, f.) A garden hybrid between *C. bellatulum* and *C. hirsutissimum.* (G. W. Schofield.)

Cypripedium Symondsiæ. (*O. R.* 1896, 16.) A garden hybrid probably between *C. venustum* and *C. purpuratum.* (H. J. Ross, Florence.)

Cypripedium villosum Truffautii. (*G. C.* 1896, xix., 104.) Leaves broader and flowers larger than in the type. (M. A. Truffaut, Versailles.)

Cyrtanthus obliquus major. (*Sand. Cat.* 1896, 57.) Amaryllideæ. G. Apparently an additional name for the type. South Africa. (F. Sander & Co.)

Cyrtochilum micranthum, Kränzl. (*G. C.* 1896, xx., 63.) Orchideæ. S. A new species resembling *C. maculatum,* but smaller, with greenish spotted sepals and petals and the lip white with two brown blotches and a yellow anterior. Brazil. (F. Sander & Co.)

Cytisus glabrescens, Sartorelli. (*M. D. G.* 1896, 25.) Leguminosæ. H. A small bush with bright yellow flowers produced in May. Mountains of Upper Italy. (L. Späth, Berlin.)

Davallia truffautiana. (*G. M.* 1896, 352, f.) Filices, G. "A particularly handsome and distinct species with large spreading fronds, a peculiarity of which is that the under surface is like the upper." (L'Horticulture Internationale, Brussels.)

***Debregeasia velutina,** Gaud. (*R. H.* 1896, 321, f. 118.) Urticaceæ. G. A shrub attaining a height of 6 to 9 ft. with stalked lanceolate, serrate leaves and shortly-stalked heads of fruit about the size of a pea, of a bright red colour. East Indies. (Paris B. G.)

Delphinium tatsiensis, Franch. (*W. G.* 1896, 27.) Ranunculaceæ. H. A species about 2 ft. in height with cobalt-blue flowers. China. (Vilmorin, Andrieux, & Co., Paris.)

Dendrobium Arachnites, Reichb. f. (*G. C.* 1896, xx., 7, f. 2.) Orchideæ. G. A dwarf species, the pseudobulbs only 3 in. long, fusiform, shining, flowers $1\frac{1}{2}$ in. across, orange-scarlet; sepals and petals linear, lip pandurate. Burma. (J. Bradshaw.)

Dendrobium chloropterum. (*G. C.* 1896, xix., 792.) G. Allied to *D. macrophyllum;* flowers greenish with a few purple lines on the lip. Australia. (H. Low & Co.)

Dendrobium Curtisii. (*Sand. Cat.* 1896, 12, f.) G. A garden hybrid between *D. aureum* and *D. Cassiope.* (F. Sander & Co.)

Dendrobium cymbidioides. (*G. C.* 1896, xix., 581, f. 90.) S. Allied to *D. Cœlogyne.* Pseudobulbs ovate, clustered; leaves linear-lanceolate, 6 in. long; scapes 9 in. erect, many flowered; flowers 2 in. across; sepals and petals narrow creamy-white; lip small white with purple markings. Java. (Sir Trevor Lawrence.)

Dendrobium holmesianum. (*G. C.* 1896, xix., 401.) G. A garden hybrid between *D. dominianum* and *D. schneiderianum.* (F. Hardy.)

Dendrobium jennyanum, Kränzl. (*G. C.* 1896, xx., 329.) G. A new species allied to *D. undulatum* from which it differs in the size of the plant and the flowers which have untwisted segments and a broad three-lobed lip. The colour is yellowish outside, brown inside and varnished. ? Australia. (Zollinger-Jenny, Zurich.)

***Dendrobium quadrilobum,** Rolfe. (*K. B.* 1896, 44.) S. A new species of the section *Cadetia* with creeping stems, short oblong one-leaved pseudobulbs and solitary terminal flowers an inch across, coloured whitish-green. ? New Guinea. (Kew.)

Dendrobium thyrsiflorum Lowii. (*G. C.* 1896, xix., 593.) Flowers creamy-white, lip narrow, spoon-shaped and streaked with yellow. (Baron Schroëder.)

Dendrobium Wiganiæ. (*G. C.* 1896, xix., 337, 553, f. 84). G. A garden hybrid between *D. signatum* and *D. nobile.* (Sir F. Wigan.)

Didymocarpus malayana, Hook. f. (*G. C.* 1896, xx., 123, f. 24; *B. M.* t. 7526.) Gesneraceæ. S. A new species, with ovate acuminate green leaves overlaid with a covering of white silvery hairs. Scapes numerous, erect 4–6 in. high, each bearing two to four flowers which are shaped like those of *Streptocarpus Rexii* but are of a primrose yellow colour. Penang. (J. Veitch & Sons.)

Digitalis campanulata. (*G.* 1896, 163.) Scrophularineæ. H. This represents a fine garden race of the common foxglove, *D. purpurea.* (Vilmorin, Andrieux, & Co., Paris.)

Dioscorea Fargesii, Franchet. (*R. H.* 1896, 540.) Dioscoreaceæ. H. A new species with edible tubers. The general botanical characters approach those of *D. pentaphylla.* Western China. (M. Maurice de Vilmorin, France.)

Dipladenia Sanderi, Hemsley. (*G. C.* 1896, xx., 652.) Apocynaceæ. S. A new species allied to *D. eximea.* Leaves thick, oblong, acuminate 2 in. long, petiole ½ in. long; flowers 3 in. long and wide, rose-coloured. Brazil. (F. Sander & Co.)

Disa pulchra, Sonder. (*G. C.* 1896, xx., 778.) Orchideæ. G. Described in 1847 but never before flowered in cultivation. Tubers large; stems 2 ft., leafy; raceme erect, 6 in. long; flowers 2 in. across, coloured pale lilac and purple; spur, including base of perianth-tube, 2 in. long. S. Africa. (Hon. W. Rothschild.)

***Dischidia hirsuta,** Decne. (*G. C.* 1896, xx., 182.) Asclepiadeæ. S. A slender climber with orbicular fleshy leaves 1 in. diameter and axillary clusters of small red tubular flowers. India and Java. (Kew.)

Dracæna Broomfieldii, Sander. (*G. C.* 1896, xx., 666, f. 115.) Liliaceæ. Leaves 15 in. long, 2 in. wide, green margined and striped with white; stem short jointed an inch in diameter. "South Sea Islands." (F. Sander & Co.)

Dracæna Rigoutsi. (*Ill. H.* 1896, 24, t. 50.) G. A variegated seedling raised from *Cordyline australis.* (M. Rigouts, Belgium.)

Draperia systyla, Torr. (*M. D. G.* 1896, 20.) Hydrophyllaceæ. H. H. A dwarf sub-shrub with long-stalked ovate hairy leaves and cymes of bright violet coloured flowers. California. (Darmstadt B. G.)

Echeveria Purpusi, Schumann. (*Gfl.* 1896, 608, f. 97; *G. C.* 1896, xx., 698, f. 123.) See *Cotyledon Purpusii.*

Echinocactus Odieri var. **Mebbesii,** Hild. (*N. G. M.* 1896, 406, f.) Cacteæ. G. A form differing from the type in its flesh-coloured flowers.

Echinocereus phœniceus var. **inermis.** K. Schum. (*M. K.* 1896, 150, f.) H. A form differing from the type in not having spines. Colorado. (L. Spaeth, Rixdorf-Berlin.)

Epidendrum atrorubens, Rolfe. (*K. B.* 1896, 46.) Orchideæ. G. A new species allied to *E. plicatum.* Leaves linear-oblong 8 in. long, panicle loose, flowers an inch across, red-purple. Mexico. (L'Horticulture Internationale, Brussels.)

Epidendrum elegantulum. (*G. C.* 1896, xix., 361, f. 49.) A garden cross between *E. Endresio-Wallisii* and *E. Wallisii.* (J. Veitch & Sons.)

Epidendrum xipheroides, Kränzl. (*G. C.* 1896, xx., 63.) S. A new species with large pear-shaped pseudobulbs, each bearing two leaves which are linear, thick, 8 in. long, ½ in. wide; raceme slender, few flowered: sepals and petals green with purple lines, lip yellow, with a thick white callus. Brazil. (F. Sander & Co.)

***Eria biflora,** Griff. (*O. R.* 1896, 10.) Orchideæ. G. Plant 6 in. high with two-flowered racemes of whitish-yellow flowers. India. (H. J. Elwes.)

***Eria cæspitosa,** Rolfe. (*K. B.* 1896, 194.) G. A new species of tufted habit without pseudobulbs; leaves 2 in. long, flowers very small, white, purple and yellow. Hainan. (Kew.)

Erigeron glabellus var. **mollis,** A. Gray. (*Gard.* 1896, xlix., 81.) Compositæ. H. A pubescent variety with large rose-coloured flowers. Colorado. (L. Späth, Berlin.)

Erigeron hybridus roseus. (*Ill. H.* 1896, 301, f. 26.) H. A garden hybrid between *E. aurantiacus* and *E. Villarsi.* (Haage & Schmidt, Erfurt.)

Erythrina constantiana, Micheli. (*R. H.* 1896, 524, t.; *Gard.* 1896, L., 408.) Leguminosæ. G. The solitary tree which has been named as above exists in the garden of M. A. Constant, Golfe Juan, Alpes Maritimes. It is about 30 ft. high with a trunk 4 ft. in diameter at the base. Branches and trunk covered with persistent spines. Racemes of large scarlet flowers are axillary towards the extremities of the branches. The species is a near ally of *E. caffra.* Origin unknown.

***Erythronium Johnsoni,** Boland. (*G. C.* 1896, xix., 548, f. 88.) Liliaceæ. H. A distinct species, with large reddish-pink flowers, deeper on the outside and a zone of deep pink at the base. Southern Oregon. (Wallace & Son.)

***Eucharis elmetana.** (*Sand. Cat.* 1896, 46.) Amaryllideæ. G. A garden hybrid between *E. Sanderi* and *E. grandiflora.* (H. Kitson.)

Eulophiella peetersiana. (*G. and F.* 1896, 514.) Orchideæ. S. A supposed new species, described as having large rose-coloured flowers on strong axillary spikes. The rhizomes are thin Iris-like and yellowish-white; the leaves are 4 in. in diameter at the base. Madagascar? (F. Sander & Co.)

***Fraxinus anomala,** Torrey. (*M. D. G.* 1896, 26.) Oleaceæ. H. A small tree with leaves most reduced to a single broadly ovate leaflet. Colorado, &c. (Kew.)

Fritillaria Bornmülleri, Hausskn. (*Gard.* 1896, xlix., 282.) Liliaceæ. A species allied to *F. aurea,* and like that species, with golden-yellow flowers. (Barr & Son.)

***Fritillaria nobilis,** Baker. (*B. M.* t. 7500.) H. [Above is correct name for plant described in New Garden Plants of 1895 under the name of *F. kotschyana affinis.*]

Geonoma siesmayeriana, L. Lind. (*Lind. Cat.* 1896, 17.) Palmæ. S. Described as a species of tufted habit with glaucous green leaves which are tinged with red when young. Habitat not given. (L'Horticulture Internationale, Brussels.)

Geophila picta, Rolfe. (*K. B.* 1896, 18.) Rubiaceæ. S. A small prostrate plant with ovate oblong leaves 2 in. long., coloured dull green with a pink mid-rib and pink hairs. Flowers small, white in many-flowered heads. British Guiana. (F. Sander & Co.)

Gerbera viridifolia, Sch. Bip. (*Gard.* 1896, xlix., 162.) Compositæ. H. This species bears white flower-heads 1¾ inches in width, on scapes 1 ft. in height. Leaves, inverted, lanceolate with long stalks. S. Africa. (Cambridge B. G.)

***Geum Heldreichii.** (*J. of H.* 1896, xxxii., 487.) Rosaceæ. H. Said to be a variety of *G. montanum* with deep orange red flowers. Greece.

Gongora portentosa var. **rosea,** Cogn. (*L.* 1896, t. 508.) Orchideæ. S. A form with sepals and petals bright rose-purple with small purplish spots, lip citron yellow. United States of Colombia. (L'Horticulture Internationale, Brussels.)

Gongora sanderiana, Kränzl. (*G. C.* 1896, xx., 456.) S. A new species allied to *G. portentosa.* Pseudobulbs conical, 5 in. long; leaves 10 in. long, 2 in. broad; racemes six-flowered; flowers yellowish with rose-coloured spots. Peru. (F. Sander & Co.)

Gutierrezia Euthamiæ, Torr. & Gray. (*M. D. G.* 1896, 26.) Compositæ. H. A suffruticose plant with narrowly-linear leaves and a profusion of small golden-yellow flower-heads. Western United States. (L. Späth, Berlin.)

Habenaria Elwesii, Hook. f. (*B. M.* t. 7478.) Orchideæ. G. This species is most nearly allied to *H. digitata,* differing in the much larger flowers, hairy petals with much longer divisions, long lobes of the lip, and spur-like stigmatic processes. Nilghiri Hills. (H. J. Elwes.)

***Haworthia xiphiophylla,** Baker. (*B. M.* t. 7505.) Liliaceæ. G. This differs from *H. setata* by its narrower thinner leaves, and from *H. arachnoidea* by the leaves not being at all pellucid or lineate. Cape Colony. (Kew.)

Helleborus caucasicus var. **nigricans.** (*Gfl.* 1896, 162.) Ranunculaceæ. H. A form differing from the type in its large bluish-black flowers. (Otto Froebel, Zurich.)

Heuchera sanguinea alba. (*Ill. H.* 1896, 334, f. 32.) Saxifrageæ. H. A.

form differing from the type in having pure white flowers. (Haage & Schmidt, Erfurt.)

*Hibiscus Archeri. (*G. and F.* 1896, 324.) Malvaceæ. G. A garden hybrid between *H. Rosa-sinensis* and *H. schizopetalus*. (Kew.)

Hippeastrum muesserianum, L. Lind. (*Ill. H.* 1896, 376, t. 72.) Amaryllideæ. S. Segments narrow, salmon-colour tinted with rose apparently nearly allied to *H. aulicum*. Brazil. (L'Horticulture Internationale, Brussels.)

*Homalopetalum jamaicense, Rolfe. (*O. R.* 1896, 204.) Orchideæ. S. A new genus allied to *Tetramicra*, remarkable in having the median petal (lip) like the lateral petals. It is of dwarf habit, the rhizomes creeping, pseudobulbs $\frac{1}{4}$ in. long, leaves ovate, $\frac{1}{2}$ in. long, peduncle 1 in. long, bearing one flower with linear segments $\frac{1}{2}$ in. long. It is figured in *Hooker's Ic. Pl.* t. 2461. Jamaica. (Kew.)

Hoya Lauterbachii, K. Schum. (*M. K.* 1896, 9, f.) Asclepiadeæ. S. A large-flowered species with hairy stems, leaves and flowers; latter dark brown-red inside, emerald green outside. New Guinea.

Idria columnaria, Kellogg. (*B. H. N.* 1896, i., 113.) Tamariscineæ. G. A curious plant with thick pyramidal spiny stems and terminal panicles of straw-coloured flowers. Lower California. (Paris B. G.)

*Iris albopurpurea, Baker. (*B. M.* t. 7511.) Irideæ. H. The nearest ally of this species is *I. hexagona*, a native of the Southern United States. The species was introduced to Kew from Japan with *I. laevigata* from which it differs in having the inner segments erect instead of horizontally spreading. Flowers white, spotted with purple. Japan.

Iris assyriaca, Hausskn. (*Gard.* 1896, xlix., 265.) H. A species belonging to the *Oncocyclus* group, bearing white flowers like a large *I. caucasica* in form. (Max Leichtlin, Baden Baden.)

Iris Lortetii alba. (*W. G.* 1896, 137.) H. H. A form differing from the type in its pure white flowers. (Dammann & Co., Naples.)

Iris paravar. Foster. (*J. of H.* 1896, xxxii., 536.) H. A garden hybrid between *I. paradoxa* and *I. variegata*. (M. Foster.)

Isoloma jaliscanum, S. Wats. (*G. and F.* 1896, 496.) Gesneraceæ. G. Stem decumbent, pubescent; leaves oblong-lanceolate 1–3 in. long; flowers in umbels, corolla an inch long, scarlet. Mexico. (Harvard B.G.)

Juniperus virginiana reptans. (*M. G. Z.* 1896, 296, f.; *M. D. G.* 1896, 55.) Coniferæ. H. A prostrate form of value for rockeries, &c. (Jena B. G.)

Juniperus virginiana turicensis. (*Gfl.* 1896, 162.) H. A form of compact, pyramidal habit, and with bluish gray leaves. (Otto Froebel, Zurich.)

*Kendrickia Walkeri, Thw. (*G. C.* 1896, xx., 394.) Melastomaceæ. S. Described as one of the most beautiful of Ceylon plants. It is a climber with creeping ivy-like stems, ovate fleshy grey-green leaves and terminal umbels in large bright red flowers. Ceylon. (Kew.)

Lælia anceps protheroeana. (*G. C.* 1896, xix., 40.) Orchideæ. G. Sepals and petals white at the base, the rest bright rose-purple; lip yellow with purple lines and a crimson-purple front lobe. (J. Broome.)

Laelia autumnalis Fournieri, E. André. (*R. H.* 1896, 547, t.) A large flowered dark coloured variety. (M. L. Fournier, Marseilles.)

Laelia pumila delicata. (*G. C.* 1896, xx., 471.) A variety with nearly pure white flowers. (F. Sander & Co.)

Laelia purpurata ashworthiana. (*G. C.* 1896, xx., 39, f. 10.) A variety with broad petals coloured purple rose and striped with white. (E. Ashworth.)

Laelia purpurata Lewisii. (*G. C.* 1896, xix., 655.) Flowers wholly white, save a few faint lines of lilac-pink on the lip. (W. L. Lewis & Co.)

Laelia purpurata, vars. (*Lind. Cat.* 1896, 47–52.) A number of varieties are here described under such names as *amœna, formosa, lobata*, &c. (L'Horticulture Internationale, Brussels.)

Laelio-cattleya Ghislainiæ. (*O. R.* 1896, 39.) Orchideæ. G. A garden hybrid between *Laelia harpophylla* and *Cattleya Prinzii*. (A. Van Imschoot, Ghent.)

Laelio-cattleya highburyensis. (*G. C.* 1896, xix., 468.) G. A garden hybrid between *Laelia cinnabarina* and *Cattleya lawrenciana*. (J. Chamberlain.)

Laelio - cattleya velutino - elegans. (*G. C.* 1896, xx., 360.) G. A garden hybrid between the species indicated in the name. (M. Fournier, Marseilles.)

Laelio-cattleya wargnyana. (*L.* 1896, t. 535.) G. A garden hybrid. (L'Horticulture Internationale, Brussels.)

Lanium subulatum, Rolfe. (*K. B.* 1896, 46.) Orchideæ. G. A new species, small in all its parts, the leaves subulate and the flowers pale green. Brazil. (F. Sander & Co.)

Larix dahurica var. **japonica,** Maxim. (*M. D. G.* 1896, 28.) Coniferæ. H. A Larch from Northern Japan with bluish-green leaves. (*L. kurilensis*, Mayr, may be the same as this.) [L. Späth, Berlin.]

***Lavatera insularis.** (*G. and F.* 1896, 164, f. 27.) Malvaceæ. H. H. A compact shrub 4 ft. through with palmately lobed leaves on long petioles and axillary solitary flowers, 2 in. diameter, coloured yellowish-white striped with purple. Mexico. (T. S. Brandegee, California.)

***Ledum glandulosum,** Nutt. (*M. D. G.* 1896, 19.) Ericaceæ. H. This differs from *L. latifolium* and *L. palustre* in its larger ovate leaves, which are not woolly but dotted underneath with impressed glands. Sierra Nevada. (Kew.)

***Lepidotrichum uechtritzianum,** Vel. & Bornm. (*Gard.* 1896, L., 238.) Cruciferæ. H. A prostrate widely-spreading herbaceous plant with white flowers. Bulgaria. (Kew.)

Libocedrus decurrens aureo-variegata. (*M. D. G.* 53.) Coniferæ. H. A form with persistently golden variegated leaves. (Dahs Reuter & Co., Oberpleis, Germany.)

Lilium Biondii, Baroni. (*B. T. O.* 1896, t. vi., 1.) Liliaceæ. H. A scarlet flowered species with linear leaves. Nearly allied to or perhaps identical with *L. sutchuenense*. China. (Florence B. G.)

Lilium chinense, Baroni. *B. T. O.* 1896, 176, t. vi., 2.) H. A scarlet-flowered lily with linear leaves nearly allied to *L. sutchuenense*. China. (Florence B. G.)

Lilium szechnense, Hort. (*G. C.* 1896, xix., 372.) A species with large bright red flowers allied to L. *Maximowiczii*. [*L. sutchuenense*, Franchet, is correct name of this plant.]

***Linospadix Micholitzii,** Ridley. (*Sand. Cat.* 1896, 50.) Palmæ. S. Described in the *Gardeners' Chronicle* 1895, xviii., p. 262, by Mr. Ridley, of Singapore, who says:—"It is unique in the genus in being quite stemless, the wedge-shaped leaves rising erect from the ground in a large tuft. They are upwards of four feet long, narrow at the base, broadening upwards, ending in a pair of long acute points." New Guinea. (F. Sander & Co.)

Lonicera hirsuta × Sullivantii. (*G. and F.* 1896, 345, f. 46.) Caprifoliaceæ. H. A garden hybrid. (Arnold Arboretum.)

***Lowia longiflora,** Scort. (*G. C.* 1896, xx., 652, f. 111.) Scitamineæ. S. A stemless plant with tufted leaves 3 ft. long, and one flowered scapes a foot long. Flowers 6 in. across, composed of three linear-lanceolate spreading olive-coloured sepals and two smaller linear purplish petals tufted at the apex, the third petal being larger, lanceolate, lip-like, and pure white. Perak. (W. Bull.)

Maclura aurantiaca var. **inermis.** Ed. André. (*R. H.* 1896, 33, f. 10.) Urticaceæ. H. A form with larger leaves than the type, and with quite spineless branches. (M. Guy, Biéré, France.)

***Macrotomia cephalotes,** A. DC. *Gfl.* 1896, 173.) Boragineæ. H. A handsome perennial with silvery leaves and large golden yellow flowers. Asia Minor. (Kew.)

***Mamillaria heeseana,** McDowell. (*M. K.* 1896, 125.) Cacteæ. G. This has the longest spines of any species of Mamillaria yet discovered. Plant depressed globose, when young clothed with soft white wool intermixed with weak bristles, naked when old. Flowers carmine-red. Mexico.

Maranta major. (*G. C.* 1896, xix., 529.) Scitamineæ. S. Plant about 3 ft. high with erect long petioles and ovate green leaf-blades. Flowers not known. (J. Veitch & Sons.)

Masdevallia Curlei. (*G. C.* 1896, xix., 40.) Orchideæ. A garden hybrid between *M. macrura* and *M. tovarensis*. (A. Curle.)

***Massonia jasminiflora,** Baker. (*B. M.* t. 7465.) Liliaceæ. G. This plant was discovered at the beginning of the century by the celebrated traveller Burchell, but up till now it has only been known from a single specimen

dried from his garden at Fulham in 1818, and preserved in the Kew Herbarium. Leaves two to a bulb, spreading on the surface of the ground. Umbel of white green tipped flowers sessile in the centre of the two leaves. Orange Free State. (Kew.)

Maxillaria striata grandiflora, Sander. (*G. C.* 1896, xx., 310.) Orchideæ. G. A variety with larger flowers than the type, white with purple lines. (F. Sander & Co.)

***Michauxia Tschihatchewii,** Fisch. & Mey. (*Gfl.* 1896, 173.) Campanulaceæ. H. A handsome biennial attaining a height of six feet and bearing large numbers of white Martagon Lily-like flowers. Radical leaves long-stalked. Asia Minor. (Kew.)

Miltonia bleuiana aurea. (*G. C.* 1896, xix., 337.) Orchideæ. G. Differs from other forms of this hybrid in having clear yellow markings at the base of the lip. (A. A. Peeters, Brussels.)

Morus alba aurea. (*M. D. G.* 1896, 2.) Urticaceæ. H. A form with golden yellow leaves and branches. (T. Rothe, Odessa.)

Morus nigra globosa. (*M. D. G.* 1896, 2.) H. A form of perfectly hemispherical habit. (T. Rothe, Odessa.)

Narcissus (triandrus × albicans. (*G. M.* 1896, xxxix., 164. f.) Amaryllideæ. H. A garden hybrid. (G. H. Engelheart.)

***Nepenthes Pervillei,** Blume. (*G. C.* 1896, xx., 239.) Nepenthaceæ. S. A distinct species with short shining-green oblanceolate leaves and dull crimson pitchers 2 in. long. Wild specimens have leaves 12 in. long and pitchers 8 in. Seychelles. (Kew.)

***Nephelaphyllum cristatum,** Rolfe. (*K. B.* 1896, 194.) Orchideæ. S. A new species, allied to *N. cordifolium*; leaves cordate ovate, 2 in. long; scape 10 in. long, few-flowered; flowers ½ in. wide, green with purple lines, lip white in front. Hong Kong. (Kew.)

Nymphæa andreana. (*Gard.* 1896, L., 325.) Nymphæaceæ. H. A garden hybrid or seedling sport. Leaves 8 in. across, slightly spotted with brown. Flowers cup-shaped, 5 in. wide, violet-red. (Latour-Marliac, Temple-sur-Lot, France.)

Nymphæa stellata eastoniensis. (*G. and F.* 1896, 474, f. 68.) S. A seedling variety with numerous broad deep blue petals. (O. Ames, Mass.)

Oberonia Myosurus, Lindl. (*O. R.* 1896, 3.) Orchideæ. G. A small species with terete, fleshy leaves covered with minute pustules. Spike cylindrical: flowers small buff-coloured. Burma. (H. Low & Co.)

Odontoglossum andersonianum Bradshawii. (*O. R.* 1896, 106.) Orchideæ. G. A variety with narrow sepals and petals coloured bright yellow, spotted with red-brown. (H. Low & Co.)

Odontoglossum andersonianum Kitsoni, O'Brien. (*G. C.* 1896, xix., 358.) G. A variety with large broad-petalled well-formed flowers, creamy white, tinged with purple and spotted with red-brown. (J. H. Kitson.)

Odontoglossum concinnum. (*G. C.* 1896, xix., 467.) A supposed natural hybrid with pale yellow flowers blotched and spotted with brown. (L'Horticulture Internationale, Brussels.)

Odontoglossum crispum ashworthianum. (*G. C.* 1896, xix., 196, f. 26; L. t. 522.) "Flowers of the largest size covered with blotches of rose and rose-purple." (E. Ashworth.)

Odontoglossum crispum augustum. (*L.* 1896, t. 524; *O. R.* 1896, 196.) A form with very large vinous red blotches. (Dallemagne & Co., Rambouillet, France.)

Odontoglossum crispum calos. (*L.* 1896, t. 118.) G. A form with a large blood-red blotch on the sepals and petals. (L'Horticulture Internationale, Brussels.)

Odontoglossum crispum citratum. (*L.* 1896, t. 521.) G. A form with citron-yellow flowers: lip passing into white at the margin, blotched with brown purple. (L'Horticulture Internationale, Brussels.)

Odontoglossum crispum jumelianum. (*G. C.* 1896, xix., 467.) G. A variety with white flowers blotched with vinous purple. (L'Horticulture Internationale, Brussels.)

Odontoglossum crispum Meleagris. (*L.* 1896, t. 520.) G. A fine form with large pale rosy-lilac sepals and petals shading into white towards the middle; lip large, white, orange yellow in centre, with irregular red spots. (L'Horticulture Internationale, Brussels.)

Odontoglossum crispum var. **sulfureum,** Rolfe. (*O. R.* 1896, 60.) G.

A variety with the flowers of an uniform sulphur-yellow colour. (R. B. White.)

Odontoglossum crispum venustum. (*G. C.* 1896, xix., 655.) "The best rich crimson-purple blotched Odontoglossum yet seen." Flowers large and full. (L'Horticulture Internationale, Brussels.)

Odontoglossum excellens luteolum. (*O. R.* 1896, 248.) G. A variety with sulphur-yellow flowers without the brown blotches of the type. (Baron Schroeder.)

Odontoglossum Halli × crispum. (*G. C.* 1896, xx., 667.) G. A garden hybrid between the two species indicated by the name. (N. C. Cookson.)

Odontoglossum hunnewellianum grandiflorum. (*L.* 1896, t. 545.) A form with larger flowers and a more brightly-coloured lip than the type. (L. Linden & Co., Moortebeek, Belgium.)

Odontoglossum luteo-purpureum ashworthianum, O'Brien. (*G. C.* 1896, xx., 63.) G. Flowers 5 in. across, sepals broad, reddish brown, with yellow tips, petals broad creamy yellow with red-brown spots; lip fringed yellow with a purple crest. Colombia. (E. Ashworth.)

Odontoglossum Rossi var. **Pauwelsiæ,** *L. Lind.* (*L.* 1896, t. 534.) G. Sepals and lateral petals almost entirely light brown. (M. Fl. Pauwels, Deurne, Belgium.)

Odontoglossum rubiginosum. (*L.* 1896, t. 517.) G. A natural hybrid near *O. wilckeanum.* Flowers light yellow with large chocolate-brown blotches. (L'Horticulture Internationale, Brussels.)

Odontoglossum spectabile. (*G. C.* 1896, xix., 467; *L.* 1896, t. 523.) A supposed natural hybrid resembling *O. excellens*; flowers yellow spotted with chestnut-brown. (L'Horticulture Internationale, Brussels.)

Odontoglossum troyanofskyanum, L. Lind. (*L.* 1896, t. 540.) A supposed natural hybrid between *O. Pescatorei* and *O. triumphans.* (L'Horticulture Internationale, Brussels.)

Odontoglossum varicosum giganteum. (*G. C.* 1896, xix., 655.) G. Flowers much larger than in the type. (Sir F. Wigan.)

Odontoglossum wilckeanum elongatum. (*J. O.* 1896, 40.) G. A variety of this natural hybrid with larger and more brightly-coloured flowers than the type. (L'Horticulture Internationale, Brussels.)

Odontoglossum wilckeanum olivare. (*J. O.* 1896, 40.) A new variety of this natural hybrid with large olive-greenish flowers. (L'Horticulture Internationale, Brussels.)

Odontoglossum wilckeanum rufum. (*L.* 1896, t. 519.) G. A form of this natural hybrid with red-brown blotches. (L'Horticulture Internationale, Brussels.)

***Olyra concinna,** Hook. f. (*B. M.* t. 7469.) Gramineæ. S. A dwarf densely-tufted perennial grass with sessile, almost imbricating, distichous leaves an inch long. Costa Rica. (Kew.)

Oncidium godseffianum, Kränzl. (*G. C.* 1896, xix., 754.) Orchideæ. A new species resembling *O. pubes,* differing in its smaller flowers and in the separation of the lateral sepals. Pseudobulbs 5 in. long, cylindrical, each bearing a pair of linear-lanceolate leaves; flower-scape long, slender, branching. Hab. —? (F. Sander & Co.)

Opuntia rhodantha, K. Schumann. (*M. D. G.*, 1896, 29.) Cacteæ. H. This has a red corolla and filaments and smooth ovary. Colorado. (L. Späth, Berlin.)

Opuntia tetracantha, J. W. Toumey. (*G. and F.* 1896, 432.) G. A new species allied to *O. Thurberi.* It is a branched shrub 2 to 5 ft. high, the stem and joints cylindrical, covered with prominent tubercles bearing tufts of brown bristles and straw-coloured, flattened, deflexed loosely sheathed spines. Flowers greenish-purple; fruit ovate, bright scarlet. Arizona. (Arizona University.)

Opuntia xanthostema, K. Schumann. (*M. D. G.* 1896, 29.) H. This species has carmine-red flowers, dark yellow filaments and a prickly ovary. Colorado. (L. Späth, Berlin.)

***Ornithogalum revolutum,** Jacq. (*G. and F.* 1896, 323.) Liliaceæ. G. An ally of *O. arabicum,* having narrow leaves 9 in. long, erect scapes 12 in. long, and a sub-umbellate raceme of about 20 flowers, each 1½ in. wide, glistening white with an eye-like blotch of olive brown. S. Africa. (Kew.)

***Palisota Maclaudi,** Cornu. (*J. H. F.* 1896, 466.) Commelynaceæ. S. A near ally of *P. thyrsiflora,* Benth., but

differing in its much longer narrower rather long stalked leaves, by the hairs of the sheaths and stalks being black and not brown, by its more woody stem, &c. Upper Guinea. (Paris B. G.)

Passiflora galbana, M. T. Masters. (*G. C.* 1896, xx., 555, f. 97.) Passifloreæ. S. A new species with entire lanceolate leaves 3 in. long and greenish-yellow flowers 3 in. across. Brazil. (R. Creighton.)

***Pentstemon secundiflorus,** Benth. (*Gard.* 1896, xlix., 478.) Scrophularinæ. H. A pretty species with blue flowers, which are suffused with bronze on the upper surface. Colorado. (Kew.)

***Pentstemon Watsoni,** A. Gray. (*Gfl.* 1896, 77.) H. A dwarf-growing compact species with roundish leaves and racemes of blackish-blue flowers. Colorado. (Herb & Wulle, Naples.)

Perezia sonchifolia, Baker. (*R. H.* 1896, 134, t.) Compositæ. H. A pretty annual with thistle-like leaves and white flower-heads like miniature Camellias. Uruguay. (Ed. André, France.)

Phaius ashworthianus. (*G. C.* 1896, xx., 534.) Orchideæ. S. A garden hybrid between *P. Mannii* and *P. maculatus.* (F. Sander & Co.)

***Phaleria ambigua,** Hook. f. (*B. M.* t. 7471.) Thymetalaceæ. S. A climbing glabrous shrub with light green somewhat leathery leaves and axillary and subterminal heads of pure white scented Daphne-like flowers. Java. (Kew.)

Philodendron robustum, L. Lind. (*Lind. Cat.*, 1896, 21.) Aroideæ. S. Described as a species of extraordinary vigour with large emerald green leaves. Habitat not given. (L'Horticulture Internationale, Brussels.)

***Physurus chinensis,** Rolfe. (*K. B.* 1896, 200.) Orchideæ. S. A new species, with short stem, caespitose ovate green leaves 4 in. long and short scapes bearing numerous small flowers. Kwantung. (Kew.)

Pittosporum eriocarpum, Royle. (*B. M.* t. 7473.) Pittosporeæ. G. A small tree with shortly-stalked leaves and terminal panicles of fragrant golden-yellow flowers. Western Himalaya. (T. Hanbury, La Mortola, Italy.)

Platycerium Veitchii. (*G. C.* 1896, xix., 652.) Filices. G. Described as a "distinct species of stout erect growth, each frond being of unusual leathery substance and dark green in colour." (J. Veitch & Sons.)

Plectocomia crinita, L. Lind. (*Lind. Cat.* 1896, 21.) Palmæ. S. Described as a species with the petioles armed with white spines in fascicles of about seven; leaves pinnate, very large glaucous green, whitish on under side. Habitat not given. (L'Horticulture Internationale, Brussels.)

Polystachya villosa, Cogn. (*J. O.* 1896, 139.) Orchideæ. S. A curious species with flat round disk-like pseudo bulbs furnished with two erect lanceolate-spathulate acute leaves and deep violet-purplish hairy flower-stems bearing somewhat fleshy old gold-coloured flowers more or less tinged with red. Madagascar. (Mme. Adde, Pauillac, France.)

Potentilla dahurica × fruticosa. (*M. D. G* 1896, 49.) Rosaceæ. H. A hybrid between the two species named. Garden origin.

Potentilla micrandra, Koehne. (*M. D. G.* 1896, 48.) H. A low bush about half as tall-growing as *P. fruticosa* with pinnate leaves and dark yellow flowers. Japan.

Potentilla parvifolia, Fischer. (*M. D. G.* 1896, 26.) H. A dwarf much-branched shrub with yellow flowers produced in July and August. Siberia. (L. Späth, Berlin.)

Primula floribunda grandiflora. (*G.* 1896, 113, t. 1424.) Primulaceæ. H. Differs from the type in having much larger flowers. (Haage & Schmidt, Erfurt.)

Prunus curdica, Fritsch. (*M. D. G.* 1896, 26.) Rosaceæ. H. Intermediate between *P. spinosa* and *P. insititia.* Asia Minor. (L. Späth, Berlin.)

***Prunus subhirtella,** Miquel. (*B. M.* t. 7508.) A small tree, the cherry-like leaves appearing after flowering. Flowers in fascicles of from three to five, white. Japan. (Arnold Arboretum.)

Pteris Childsii. (*G. C.* 1896, xx., 470.) Filices. G. "Fronds compound, pinnæ much subdivided, the tips and margins being percristate." Origin not stated. (T. Childs.)

Pteris Drinkwateri. (*G. C.* 1896, xix., 592.) G. Probably a seedling variety of *P. umbrosa*, with fronds 2 ft. high and pinnæ ¾ in. wide, dark green. (Messrs. Stroud Bros.)

***Pterisanthes polita,** Miq. (*G. C.* 1896, xx., 182.) Ampelideæ. S. A climber

with the habit of a Cissus, cordate leaves 5 in. long and a flower rachis flattened like a knife blade, bearing stalked flowers round the margin and sessile flowers on the surface. Malaya. (Kew.)

Pyrus Malus var. **aurea,** Späth. (*G.* 1896, 169, t. 1425.) Rosaceæ. H. A form with leaves blotched with bright golden yellow. (L. Späth, Berlin.)

Quercus palustris Reichenbachi (*M. D. G.* 1896, 27.) Cupuliferæ. H. A form with the leaves red from their first opening. (H. Wendland, Herrenhausen, Hanover.)

Quercus pedunculata umbraculifera. (*M. D. G.* 1896, 2.) H. A form of broadly globose habit; a seedling raised from acorns of *Q. p. fastigiata.* (L. Frommel, Odessa.)

Restrepia sanguinea, Rolfe. (*K. B.* 1896, 44.) Orchideæ. G. A new species resembling *R. pandurata* but with crimson flowers. The leaves are elliptical, 2 in. long, and the peduncle is of the same length. Colombia. (Charlesworth & Co.)

Rhipsalis robusta, G. A. Lindb. (*M. K.* 1896, 53.) Cacteæ. G. A South Brazilian species with stout terete branches; flowers produced near tips of the stems. (G. A. Lindberg, Stockholm.)

Rhododendron Falconeri × niveum. (*G. C.* 1896, xix., 702.) Ericaceæ. G. A garden hybrid between the two species indicated in the name. Origin uncertain.

Rhododendron halopeanum. (*R. H.* 1896, 359, and 428, t.) H. A garden hybrid between *R. griffithianum* and *R. arboreum.* (M. Halopé, Cherbourg.)

Rhododendron Luscombei splendens. (*G. C.* 1896, xix., 702.) H. Differs from the type in having flowers of a rich crimson colour. (S. C. Godman.)

Rhododendron nobilius. (*G. C.* 1896, xx., 765.) G. A garden hybrid between *R. Teysmanni* and *R. javanicum.* (J. Veitch & Sons.)

Ribes succirubrum. (*M. G. Z.* 1896, 299.) Saxifrageæ. H. A hybrid between *R. divaricatum* and *R. niveum.* (H. Zabel, Gotha.)

Saccolabium Barbeyæ, Kränzl. (*B.B.* 1896, 40). Orchideæ. S. This is *Angræcum imbricatum,* Lindl.

Salix humboldtiana var. **fastigiata,** Ed. André. (*R. H.* 1896, 177, ff. 58–60.) Salicineæ. G. A form of pyramidal habit resembling that of the Lombardy Poplar. Peru, &c. (Ed. André, France.)

***Salvia schiedeana,** Stapf. (*K. B.* 1896, 19.) Labiatæ. G. A new species with hairy stems a foot high and ovate crenate leaves 3 in. long; flower-spike 5 in. long, flowers blue. Mexico. (Kew.)

Sambucus racemosa plumosa aurea. (*M. D. G.* 1896, 27.) Caprifoliaceæ. H. A form of the scarlet-berried elder with finely-cut golden leaves. (De Voss, Holland.)

***Sarcochilus hainanensis,** Rolfe. (*K. B.* 1896, 199.) Orchideæ. S. A new species allied to *S. Arachnites;* stem slender; leaves linear-oblong 4 in. long; raceme 3 in. long; flowers light yellow, sepals and petals $1\frac{1}{2}$ in. long, lip shorter. Hainan. (Kew.)

***Sarracenia Sanderæ.** (*G. C.* 1896, xx., 534.) Sarraceniaceæ. A seedling or hybrid of garden origin. (F. Sander & Co.)

***Saxifraga afghanica,** Aitch. & Hemsl. (*Gard.* 1896, xlix., 260.) Saxifrageæ. H. A distinct plant with white flowers belonging to the Megasea group. Afghanistan. (Kew.)

Sedum englerianum, Graebner. (*N. B.* 1896, 186.) Crassulaceæ. H. A densely-caespitose species probably nearly allied to *S. dasyphyllum* or *S. gypsicolum.* Pyrenees. (Berlin B. G.)

***Senecio multiflorus,** DC. (*G. C.* 1896, xix., 460, ff. 67–69.) Compositæ. G. An ally of the Garden Cineraria (*S. cruentus*). It has a tall leafy stem branched above, with numerous heads of lilac purple flowers 1 in. across. Syn. *Doronicum Bourgæi,* B. M. t. 4994. Canary Islands. (Cambridge B. G.)

Sidalcea malvæflora Listeri. (*Gard.* 1896, L., 131.) Malvaceæ. H. A variety with blush-pink flowers. (Lister.)

Sobralia Brandtiæ, Kränzl. (*G. C.* 1896, xix., 608.) Orchideæ. G. A new species with the habit of *S. macrantha.* Leaf sheaths marked with black spots; flowers from a cone-like head; sepals and petals linear-oblong rose-purple; lip convolute, disk yellow, margins wavy. S. America. (F. Sander & Co.)

Sophora platycarpa, Maxim. (*M. D. G.* 1896, 27.) Leguminosæ. H. In habit and general aspect scarcely distinguishable from *S. japonica,* but differing marked in its fruits. Japan. (L. Späth, Berlin.)

Sophro-Lælia Marriottii. (*G. C.* 1896, xx., 667.) Orchideæ. G. A garden hybrid between *Sophronitis grandiflora* and *Lælia flava*. (Sir W. Marriott.)

Schoenlandia gabonensis, Cornu. (*J. H. F.* 1896, 467.) Pontederiaceæ. S. An acaulescent terrestial plant with cordate acute leaves. The solitary flowers spring from short branches in the axils of the bracts; branches, bracts and flowers being a pale violet colour. Western Tropical Africa. (Paris B. G.)

Selenipedium Verdieri. (*J. O.* 1896, 100.) Orchideæ. A garden hybrid between *S. caudatum Wallisii* and *S. Roezlii.*

Solanum Farini, Hort. (*W. G.* 1896, 405, f. 59.) G. A strong-growing blue-flowered spiny species allied to *S. duplosinuatum*. Africa. (Dammann & Co., Naples.)

Sorbus Aucuparia rossica fructu dulci. (*M. D. G.* 1896, 28.) Rosaceæ. H. A form of the Mountain Ash with edible fruits; introduced from Russia. (L. Späth, Berlin.)

***Stephanandra Tanakæ,** Franch. & Savat. (*Gfl.* 1896, 505, t. 1431.) Rosaceæ. H. An interesting and pretty deciduous shrub larger in all its parts than *S. flexuosa*. Japan. (Kew.)

Taxus floridana, Nutt. (*G. and F.* 1896, 261.) Taxaceæ. H. "A bushy tree, rarely 30 ft. high, with a short trunk occasionally a foot in diameter, and many stout, spreading branches." Florida. (Biltmore Arboretum.)

Thunia alba gigantea. (*Sand. Cat.* 1896, 17.) Orchideæ. S. Flowers larger than in the type, pure white, the lip golden yellow. (F. Sander & Co.)

Thuya occidentalis Elwangeriana aurea. (*M. D. G.* 1896, 28.) Coniferæ. H. A form of the American Arborvitæ with golden yellow leaves which do not *burn* during summer. (L. Späth, Berlin.)

Thuya occidentalis Wagneri. (*M. D. G.* 1896, 28.) H. A form of thick, compact, narrow pyramidal habit. (O. Froebel, Zurich.)

Tigridia Pavonia alba immaculata. (*Gard.* 1896, xlix., 361.) Irideæ. A snowy white form without spots. (Van Tubergen, junr., Haarlem.)

***Tigridia Pavonia flava.** (*Gard.* 1896, L., 22.) A distinct variety with pale yellow flowers. (Kew.)

Todea arborea bipinnatifida. (*G. C.* 1896, xix., 652.) Filices. G. A variety with finely divided fronds, lighter in colour and more elegant than the type. (J. Veitch & Sons.)

Trichomanes Fraseri, Jenm. (*G. C.* 1890, xx., 266.) Filices. S. A new species with creeping rootstock, small erect pale green naked fronds which are sub-flabellate, $\frac{1}{4}$ in. long lobed the sori confined to the top lobes. West Indies. (P. Neill Fraser.)

Ulmus campestris umbraculifera nova. (*M. D. G.* 1896, 28.) Urticaceæ. H. This has smaller leaves and a denser habit than *U. c. umbraculifera*. (L. Späth, Berlin.)

***Utricularia ianthina,** Hook. f. (*B. M.* t. 7466.) Lentibularieæ. S. A handsome species with reniform leaves and large pale blue corollas, the rounded convex part of the lower lip being marked with two vertical golden bands edged with deep violet. In a wild state grows in the axils of the leaves of a *Vriesia*. Brazil. (F. Sander & Co., St. Albans.)

***Uvaria virens,** N. E. Br. (*K. B.* 1896, 16.) Anonaceæ. S. A new species with hairy stems and oblong leaves 3 to 6 in. long; flowers sessile in pairs, small, yellow-green. Delagoa Bay. (Kew.)

Vanda Bensoni var. **tristis,** Parish. (*G. C.* 1896, xix., 422.) Orchideæ. G. A variety with flowers coloured sulphur-yellow outside and dirty brown within, lip whitish yellow with green side-lobes. Moulmien. (F. Sander & Co.)

Vanda bicolor, Griff. (*G. C.* 1896, xix., 422.) G. A rare species recently reintroduced. Stem 3 ft.; leaves 6–10 in. long obtusely two-lobed; scape stout erect, 4–6 flowered, flowers 2 in. diameter, brownish purple, tessellated, lip margined with yellow and with large orbicular side-lobes. Himalaya. (F. Sander & Co.)

Vanda kimballiana var. **Lacknerae,** Kränzl. (*G.* 1896, 337, t. 1428.) S. A form with flowers of a pure white except the small side lobes of the lip which are yellow. (C. Lackner, Steglitz, Germany.)

Vanda teres gigantea. (*G. C.* 1896, xix., 593.) S. A large-flowered richly coloured form with stouter stems and leaves than the type. (Baron Schroëder.)

Viola beckiana, Fiala. (*W. G.* 1896, 197, t. ii.) Violarieæ. H. A handsome rock plant with large blue or yellow flowers. Bosnia.

***Vitis doaniana**, Munsen. (*G. and F.* 1896, 454, f. 59.) Ampelideæ. H. A very hardy vine with hoary white leaves and branches. Texas.

Vitis Solonis robusta. (*W. G.* 1896, 34.) H. A garden hybrid between *V. Solonis* and *V. riparia*. (Besson fils, Marseilles.)

Vriesia mirabile. (*Jard.* 1896, 199.) S. A garden hybrid between *V. hieroglyfica* and *V. cardinalis*. (M. G. Lemaitre, Versailles.)

Vriesia Mortierii. (*R. H.* 1896, 219.) S. A garden hybrid between *Encholirion roseum* and *Vriesia incurvata*. (J. Sallier fils, Paris.)

Vriesia Poelmani. (*R. H. B.* 1896, 229, t.) S. A seedling between *V. splendens* and *V. Van Geerti*. (M. Duval, Versailles.)

Watsonia iridifolia Ardernei. (*G. and F.* 1896, 404.) Irideæ. H. H. A white flowered subvariety of *W. Meriana*. It is identical with *W. iridifolia O'Brieni*. *See* New Garden Plants for 1889. (R. Wallace & Co.)

Zamia noeffiana, L. Lind. (*Lind. Cat.* 1896, 23.) Cycadaceæ. G. Described as a handsome species allied to *Z. Lindeni* with large fronds, the pinnæ also large and with marginal teeth. S. America. (L'Horticulture Internationale, Brussels.)

Zephyranthes taubertiana, Harms. (*Gfl.* 1896, 281, t. 1427.) Amaryllideæ. G. A species with narrow linear leaves and large pink-tinted flowers. Brazil. (Berlin B. G.)

Zygopetalum Perrenaudii. (*G. C.* 1896, xix., 337, 367, f. 50.) Orchideæ. G. A garden hybrid between *Z. intermedium* and *Z. maxillare Gauthieri*. (A. A. Peeters, Brussels.)

BULLETIN

OF

MISCELLANEOUS INFORMATION.

APPENDIX III.—1897.

LIST of the STAFFS of the ROYAL GARDENS, Kew, and of Botanical Departments and Establishments at Home, and in India and the Colonies, in Correspondence with Kew.

* Trained at Kew. † Recommended by Kew.

Royal Gardens, Kew:—

Director - - - - -	W. T. Thiselton-Dyer, C.M.G., C.I.E., F.R.S., LL.D., Ph.D., M.A., F.L.S.
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Assistant (Office) - - -	*John Aikman.
" " - - - -	*William Nicholls Winn.

Keeper of Herbarium and Library	John Gilbert Baker, F.R.S., F.L.S.
Principal Assistant (Phanerogams)	*William Botting Hemsley, F.R.S., F.L.S.
" " (Cryptogams) -	George Massee, F.L.S.
Assistant (Herbarium) - -	Nicholas Edward Brown, A.L.S.
" " - -	*Robert Allen Rolfe, A.L.S.
" " - -	Charles Henry Wright.
" " - -	*Sidney Alfred Skan.
" " - -	I. H. Burkill, F.L.S.
" for India - - -	Otto Stapf, Ph.D.

14800—1375—10/97 Wt 61 D & S

Honorary Keeper, Jodrell Laboratory	Dukinfield Henry Scott, F.R.S., M.A., Ph.D., F.L.S.

Keeper of Museums	John Reader Jackson, A.L.S.
Assistant (Museum)	John Masters Hillier.
Preparer	George Badderly.

Curator of the Gardens	George Nicholson, A.L.S.
Assistant Curator	William Watson.
Foremen :—	
Arboretum	*William J. Bean.
Herbaceous Department	*Walter Irving.
Greenhouse and Ornamental Department.	Frank Garrett.
Temperate House (Sub-tropical Department).	*William Dallimore.

Cambridge.—University Botanic Garden :—

Professor	Henry Marshall Ward, M.A., Sc.D., F.R.S., F.L.S.
Secretary to Botanic Garden Syndicate	Walter Gardiner, M.A., F.R.S.
Curator	*Richard Irwin Lynch, A.L.S.

Dublin.—Royal Botanic Gardens, Glasnevin :—

Keeper	Frederick W. Moore A.L.S.

Trinity College Botanic Gardens :—

Professor	E. Perceval Wright, M.D., F.L.S., Sec. R.I.A.
Curator	*F. W. Burbidge, M.A., F.L.S.

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Regius Keeper	Isaac Bayley Balfour, M.D., D.Sc., F.R.S., F.L.S.
Head Gardener	A. D. Richardson.
Assistant Gardener	*R. L. Harrow.

Glasgow.—Botanic Gardens :—

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Curator	*Daniel Dewar.

Oxford.—University Botanic Garden :—

Professor	Sydney H. Vines, D.Sc., F.R.S., F.L.S.
Curator	*William Baker.

COLONIES.

Antigua. (*See* Leeward Islands.)

Barbados.—Dodd's Reformatory, Botanic Station :—

	Superintendent	John R. Bovell, F.C.S. F.L.S.

British Guiana.—Botanic Gardens :—

Georgetown	Superintendent and Government Botanist.	*George S. Jenman, F.L.S.
	Head Gardener	†John F. Waby.
	Second "	*Robert Ward.
	Promenade Garden :—	
	Head Gardener	William Jackson.
Berbice	Keeper	Richard Hunt.

British Honduras.—Botanic Station :—

	Curator	Eugene Campbell.

Canada.—

Ottawa	Dominion Botanist	Prof. John Macoun, M. A., F. R. S. C., F.L.S.
	Assistant "	Jas. M. Macoun.
	Director of Government Experimental Farms.	Prof. Wm. Saunders, F.R.S.C., F.L.S.
	Botanist and Entomologist.	James Fletcher, F.L.S.
Montreal	Director, University Botanic Garden.	Prof. D. P. Penhallow, B.Sc.

Cape Colony.—

	Government Botanist	Prof. MacOwan, F.L.S.

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	Clerk	J. Ferdinandus.
	Draughtsman	W. de Alwis
Hakgala	Superintendent	*William Nock.
	Clerk and Foreman	M. G. Perera.
Henaratgoda	Conductor	S. de Silva, Arachchi.
Anuràdhapura	"	D. F. de Silva.
Badulla	"	D. A. Guneratne.

Dominica. (*See* Leeward Islands.)

Falkland Islands.—Government House Garden :—

	Head Gardener	*Albert Linney.

Fiji.—Botanic Station :—

	Curator - - -	*Daniel Yeoward.

Gambia.—Botanic Station :—

	Curator - - -	*Walter Haydon.

Gold Coast.—Botanic Station :—

	Curator - - -	*Charles Henry Humphries.

Grenada.—Botanic Garden :—

	Curator - - -	*Walter E. Broadway.

Hong Kong.—Botanic and Afforestation Department :—

	Superintendent - -	†Charles Ford, F.L.S.
	Assistant Superintendent	*W. J. Tutcher.

Jamaica.—Department of Public Gardens and Plantations :—

	Director - - -	†William Fawcett, B.Sc., F.L.S.
Hope Gardens -	Superintendent - -	*William Cradwick.
Castleton Garden	,, -	*William J. Thompson.
Cinchona (Hill Garden).	,, -	*William Harris.
Kingston Parade Garden.	,, -	John Campbell.
King's House Garden.	,, -	*Thomas J. Harris.
Bath - - -	Overseer - - -	W. Groves.

Lagos.—Botanic Station :—

	Curator - - -	*Henry Millen.
	Assistant - - -	*F. G. R. Leigh.
	,, - - -	*T. B. Dawodu.

Leeward Islands.—Botanic Stations :—

Antigua - -	Acting Curator - -	Alleyne S. Archer.
Dominica - -	Curator - - -	*Joseph Jones.
Montserrat -	——— -	———
St. Kitts-Nevis -	Head Gardener - -	Joseph Wade.

Malta.—Argotti Botanic Garden :—

	Director - - -	Dr. Francesco Debono.

Mauritius.—Department of Forests and Botanic Gardens :—

Pamplemousses -	Director - - -	———
	Assistant Director of Gardens.	J. Vankeirsbilck.
	Overseer - - -	J. Powell.
	Assistant Director of Forests.	Paul Koenig.
Curepipe - -	Overseer - - -	F. Bijoux.
Reduit - -	,, - - -	W. A. Kennedy.

Montserrat. (*See* Leeward Islands.)

Natal.—Botanic Gardens :—

Durban - -	Curator - - -	John Medley Wood, A.L.S.
	Head Gardener - -	*James Wylie.
	Propagator - -	*William Thorpe.
Pietermaritzburg	Curator - - -	G. Mitchell.

New South Wales.—Botanic Gardens :—

Sydney - -	Director - - -	J. H. Maiden, F.L.S.

New Zealand :—

Wellington.—Colonial Botanic Garden :—

	Director - - -	Sir James Hector, K.C.M.G., F.R.S.
	Head Gardener - -	G. Gibb.
Dunedin - -	Superintendent - -	J. McBean.
Napier - -	,, - -	W. Barton.
Invercargill -	Head Gardener - -	Thomas Waugh.
Auckland - -	Ranger - - -	William Goldie.
Christchurch -	Head Gardener - -	*Ambrose Taylor.

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	Assistant Curator -	*John H. Holland.

Queensland.—Botanic Department :—

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Botanic Gardens :—		
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	Overseer - - -	J. Tobin.
Acclimatisation Society's Gardens :—		
	Secretary and Manager	Wm. Soutter.
	Assistant ,, -	A. Humphrey.
Rockhampton -	Superintendent - -	J. S. Edgar.

St. Kitts-Nevis. (*See* Leeward Islands.)

St. Lucia.—Botanic Station :—

	Curator - - -	*John Chisnall Moore.

St. Vincent.—Botanic Station :—

	Curator - - -	*Henry Powell.

Sierra Leone.—Botanic Station :—

	Curator - - -	*Frederick Enos Willey

South Australia.—Botanic Gardens :—

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Port Darwin -	Curator - -	Nicholas Holtze.

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	Assistant Superintendent.	*Walter Fox.
Penang -	- Assistant Superintendent.	†Charles Curtis, F.L.S

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Curator - - -	J. G. Luehmann, F.L.S.

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Consulting Botanist -	F. Turner, F.L.S. (Sydney).

Zanzibar.—

Director of Agriculture.	R. N. Lyne.

INDIA.

Botanical Survey.—Director, George King, M.D., LL.D., C.I.E., F.R.S., F.L.S.

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Lecturer on Botany, College of Science, Poona -	*G. Marshall Woodrow.

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Government Botanist	———

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Bengal:—

	Reporter on Economic Products to the Government of India, Indian Museum, Calcutta	George Watt, M.B., C.M., C.I.E., F.L.S.

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	1st Assistant -	*Joseph Parkes.
	2nd „ -	G. A. Gammie.
	3rd „ -	*Amos Hartless.

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Bombay.—

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Bombay.—Municipal Garden:—

	Superintendent -	C. D. Mahaluxmivala.

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	Superintendent -	*William Strachan.

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	Curator of Gardens and Parks.	*Robert L. Proudlock.

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Punjab.—

Lahore - -	Superintendent -	H. G. Hein.

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ROYAL GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

APPENDIX II.—1897.

CONTENTS.

NEW GARDEN PLANTS OF THE YEAR 1896.

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1897.

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1892 -	3 0	3 4½	3 6½
1893 -	3 0	3 4½	3 6½
1894 -	3 0	3 4½	3 7½
1895 -	3 0	3 4½	3 6½

The Annual Volumes for 1887 to 1890 are out of print and cannot now be supplied.

The Index to the first five volumes, being Appendix IV., 1891, may be had separately, price 2*d.*

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ROYAL GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

APPENDIX II.—1897.

NEW GARDEN PLANTS OF THE YEAR 1896.

The number of garden plants annually described in botanical and horticultural publications, both English and foreign, is now so considerable that it has been thought desirable to publish a complete list of them in the *Kew Bulletin* each year. The following list comprises all the new introductions recorded during 1896. These lists are indispensable to the maintenance of a correct nomenclature, especially in the smaller botanical establishments in correspondence with Kew, which are, as a rule, only scantily provided with horticultural periodicals. Such a list will also afford information respecting new plants under cultivation at this establishment, many of which will be distributed from it in the regular course of exchange with other botanic gardens.

The present list includes not only plants brought into cultivation for the first time during 1896, but the most noteworthy of those which have been re-introduced after being lost from cultivation. Other plants included in the list may have been in gardens for several years, but either were not described or their names had not been authenticated until recently.

In addition to species and botanical varieties, all hybrids, whether introduced or of garden origin, with botanical names, and described for the first time in 1896, are included. It has not been thought desirable, however, to give authorities after the names of garden hybrids in such genera as *Cypripedium*, &c. Mere garden varieties of such plants as *Coleus*, *Codiæum* or *Narcissus* are omitted for obvious reasons.

In every case the plant is cited under its published name, although some of the names are doubtfully correct. Where, however, a correction has appeared desirable, this is made.

The name of the person in whose collection the plant was first noticed or described is given where known.

An asterisk is prefixed to all those plants of which examples are in cultivation at Kew.

The publications from which this list is compiled, with the abbreviation used to indicate them, are as follows:—*B. B.*—Bulletin de L'Herbier Boissier. *B. H. N.*—Bulletin du Museum d'histoire naturelle, Paris. *B. M.*—Botanical Magazine. *Bruant Cat.*—Bruant's Catalogue

of New Plants, 1896. *B. T. O.*—Bulletino della R. Società Toscana di Orticultura. *Bull Cat.*—Bull, Catalogue of New, Beautiful, and Rare Plants. *Gard.*—The Garden. *G. C.*—Gardeners' Chronicle. *G. and F.*—Garden and Forest. *Gfl.*—Gartenflora. *G. M.*—Gardeners' Magazine. *Ill. H.*—L'Illustration Horticole. *Jard.*—Le Jardin. *J. of H.*—Journal of Horticulture. *J. H. F.*—Journal de la Société nationale d'horticulture de France. *J. O.*—Journal des Orchidées. *K. B.*—Bulletin of Miscellaneous Information, Royal Gardens, Kew. *L.*—Lindenia. *Lem. Cat.*—Lemoine, Plantes Nouvelles. *Lind. Cat.*—L'Horticulture Internationale, Catalogue. *M. D. G.*—Mitteilungen der Deutschen Dendrologischen Gesellschaft. *M. G. Z.*—Möller's Deutsche Gärtner-Zeitung. *M. K.*—Monatsschrift für Kakteenkunde. *N. B.*—Notizblatt des Königl. botanischen Garten und Museums zu Berlin. *N. G. M.*—Dr. Neubert's Garten-Magazin. *O. R.*—Orchid Review. *R. H.*—Revue Horticole. *R. H. B.*—Revue de l'Horticulture Belge. *Sand. Cat.*—Sanders' Catalogue of New Plants, 1895. *Spaeth Cat.*—L. Spaeth, General Nursery Catalogue. *Veitch Cat.*—Veitch & Sons, Catalogue of Plants. *W. G.*—Wiener Illustrirte Garten-Zeitung.

The abbreviations in the descriptions of the plants are:—*ft.*—Foot or Feet. *G.*—Greenhouse.—*H.* Hardy. *H. H.*—Half-hardy. *in.*—Inches. *S.*—Stove.

Abies grandis pendula. (*M. D. G.* 1896, 28.) Coniferæ. H. A weeping form. Originated in nursery of L. Späth, Berlin.

Acalypha Sanderi, N. E. Brown. (*G. C.* 1896, xx., 392.) Urticaceæ. S. A new species attaining a height of 10 to 15 ft. with large ovate green serrated leaves and long drooping tail-like spikes of bright rose red flowers. New Guinea. (F. Sander & Co.)

Acanthophippium eburneum, Kränzl. (*G. C.* 1896, xx., 266.) Orchideæ. S. A new species affined to *A. Curtisii.* Pseudobulbs angular, 2 to 3 in. long, purplish; leaves oblong lanceolate, plicate, 8 in. long, 2 in. wide; scape two flowered; flowers nearly 2 in. long, white. Malaya? (P. Wolter, Magdeburg.)

Acanthophippium mantinianum. *L.* Lind. & Cogn. (*J. O.* 1896, 138; *L.* 1896, t. 536.) S. A near ally of *A. bicolor*, but differing in its much more robust habit and in the colour of the flowers. Sepals yellow slightly shaded with green, spotted and blotched with purple; petals like sepals but lower portion whiter; lip waxy white, thickened part of disk orange yellow with ridges spotted and lined with purple. Phillipines. (L'Horticulture Internationale, Brussels.)

Acer campestre, var. **postelense,** R. Lauche. (*M. D. G.* 1896, 80.) Sapindaceæ. H. A yellow-leaved form of the common maple.

Acer Duretti aureo-marginatum. (*M. D. G.* 1896, 79.) H. A form with leaves margined and dotted with yellow.

Acer Ginnala, Maxim. (*M. D. G.* 1896, 79.) H. The two following varieties of this species are described by Count Schwerin; the names are descriptive enough:—*angustilobum*, *pulverulentum.*

Acer Negundo varieties. (*M. D. G.* 1896, 78.) H. The following forms of this species are described and figured, viz.:—*densiflorum, falcatum, koehneanum, parallelum, rectangulatum.*

Acer Negundo boreale. (*M. D. G.* 1896, 2.) H. Said to have been introduced from Canada and to be hardy in Russia, and to ripen seeds where the form usually grown in Europe is killed by cold. (H. Schroeder, Moscow.)

Acer Negundo odessanum. (*M. D. G.* 1896, 2.) H. A form with leaves of a deeper golden colour and retaining that colour longer than the ordinary golden *Acer Negundo.* (T. Rothe, Odessa.)

Acer platanoides, var. **multicolor.** (*Gfl.* 1886, 219.) H. A form of the Norway Maple with large red leaves later showing yellowish-white specks and blotches.

***Adiantum bessonianum.** (*G. C.* 1896, xx., 75; *G. and F.* 1896, 314.) Filices. S. A variety of *A. tenerum* with crowded imbricating reniform pinnæ. West Indies. (J. O'Brien.)

*Adonis amurensis, Regel & Radde. (*G. C.* 1896, xix., 240.) Ranunculaceæ. H. A pretty plant with much divided leaves and yellow flowers about 2 in. in diameter. North China. (Kew.)

Aerides Fieldingi album. (*L.* 1896, t. 538.) Orchideæ. S. A form differing from the type in having entirely white flowers. (M. Fl. Pauwels, Deurne, Belgium.)

*Agave laxifolia, Baker. (*B. M.* t. 7477.) Amaryllideæ. G. A species of the section *Rigidæ* near *A. excelsa*. The flowers give out a smell exactly like that of mice. Mexico. (Kew.)

*Akebia lobata, Decne. (*B. M.* t. 7485.) Berberideæ. H. This differs from *A. quinata* in having more woody branches, and trifoliate leaves with broad lobulate very pale green more membranous leaflets, the flowers too are smaller, though of the same structure and colour. Japan, North China. (Kew.)

Alocasia sanderiana gandavensis. (*Ill. H.* 1896, 267, t. 65.) Aroideæ. S. A form with young leaves of purplish ground colour and vermilion-tinted veins; this coloration remains constant on the under surface but gradually changes to green on the upper surface. (Louis De Smet-Duvivier, Ghent.)

Aloe abyssinica, Lam. (*W. G.* 1896, 102.) Liliaceæ. G. The following varieties are described by C. Sprenger: *erecta, glauca, robusta, recurvata, pygmæa, maculata.* (Dammann & Co., Naples.)

Aloe Bedinghausii. (*M. K.* 1896, 24.) G. A garden hybrid between *Gasteria nigricans* and *Aloe longiaristata.* (Haage & Schmidt, Erfurt.)

*Aloe Beguinii. (*M. K.* 1896, 24.) G. A garden hybrid between *Gasteria verrucosa* and *Aloe longiaristata.* (Haage & Schmidt, Erfurt.)

Aloe Chludowii. (*M. K.* 1896, 24.) G. A garden hybrid, whose parents are given as probably *Gasteria scaberrima* and *G. verrucosa.* (Haage & Schmidt, Erfurt.)

Aloe cyanea. (*M. K.* 1896, 24.) G. A garden hybrid between *A. glauca* and *A. incana.* (Haage & Schmit, Erfurt.)

Aloe de Laetii. (*M. K.* 1896, 24.) G. A garden hybrid between *A. ciliaris* and *A. soccotrina.* (Haage & Schmidt, Erfurt.)

Aloe Holtzei. (*M. K.* 1869, 24.) G. A garden hybrid whose probable parents are given as *Gasteria intermedia* and *Haworthia Radula.* (Haage & Schmidt, Erfurt.)

Aloe Hoyeri. (*M. K.* 1896, 24.) G. A garden hybrid between *Aloe serrata* and *Lomatophyllum borbonicum.* (Haage & Schmidt, Erfurt.)

Aloe hybrida gloriosa. (*M. K.* 1896, 27.) G. A garden hybrid between *Lomatophyllum borbonicum* and *Gasteria maculata.* (Haage & Schmidt, Erfurt.)

Aloe Lapaixii. (*M. K.* 1896, 27.) G. A garden hybrid between *Gasteria maculata* and *Aloe longiaristata.* (Haage & Schmidt, Erfurt.)

Aloe Lauchei. (*M. K.* 1896, 27.) G. A garden hybrid between *Gasteria pulchra* and *G. scaberrima.* (Haage & Schmidt, Erfurt.)

Aloe Nowotnyi. (*M. K.* 1896, 27.) G. A garden hybrid of which *A. longiaristata* is one of the parents. (Haage & Schmidt, Erfurt.)

Aloe Quehlii. (*M. K.* 1896, 27.) G. A garden hybrid between *Gasteria maculata* and *G. formosa.* (Haage & Schmidt, Erfurt.)

Amaranthus Dussii, Sprenger. (*B. T. O.* 1896, 178.) Amarantaceæ. H. A handsome annual with brightly coloured leaves and flowers. Perhaps a variety of *A. spinosus.* West Indies. (Dammann & Co., Naples.)

Amaranthus superbus. (*Ill. H.* 1896, 141, f. 15.) H. H. Probably a variety of *A. melancholicus* with elliptic leaves blood-red above and crimson beneath. (Dammann & Co., Naples.)

Anchusa affinis, *R. Br.* (*B. T. O.* 1896, 220, f. 12.) Boragineæ. H. A handsome annual or perennial with large forget-me-not-like flowers. Abyssinia. (Dammann & Co., Naples.)

Angraecum Fournieræ, Ed. André. Orchideæ. (*R. H.* 1896, 256, f.; *O. R.* 1896, 196.) A synonym of *A. stylosum,* Rolfe. (*K. B.* 1895, 194.)

Anthurium pumilum. (*G. C.* 1896, xix., 401.) Aroideæ. S. A garden seedling or hybrid; parentage not stated. (Sir Trevor Lawrence.)

Anthurium triumphans. (*G. C.* 1896, xix., 650.) S. A seedling or garden hybrid with pink spathe and yellow spadix. (J. Laing & Sons.)

Aralia chinensis foliis aureo variegatis. (*M. G. Z.* 1896, 323.) Araliaceæ. H. A form with golden variegated leaves. (Peter Smith & Co., Bergedorf, Germany.)

Arctostaphylos nevadensis. A. Gray. (*M. D. G.* 1896, 18.) Ericaceæ. H. A prostrate evergreen bush with ovate leathery leaves and short racemes of reddish flowers. Sierra Nevada.

Artemisia frigida, Willd. (*M. D. G.* 1896, 25). Compositæ. H. A small bush, herbaceous from a suffrutescent base, with finely cut silvery-gray leaves. North Asia. N. W. America. (L. Späth, Berlin.)

Aspidium cristatum × marginale. (*G. and F.* 1896, 444, f. 58.) Filices. H. A supposed natural hybrid between the two species indicated in the name. Massachusetts. (G. E. Davenport, Medford, Mass., U.S.A.)

Aspidium simulatum, Davenport. (*G. and F.* 1896, 484, f. 69.) H. A new species allied to *A. Thelypteris*, which it resembles in general characters differing chiefly in its longer stipe, introrse lower pinnæ, larger sori and less convolute margins. Missouri. (G. E. Davenport, Medford, Mass., U.S.A.)

Asplenium Herbstii. (*G. C.* 1896, xx., 470.) Filices. H. "Fronds very foliaceous and a bright olive-green colour." Origin not stated. (H. B. May.)

Aster Vilmorini, Franch. (*J. H. F.* 1896, 1188.) Compositæ. H. A species remarkable for its large flower-heads with ray-florets of a bluish-purple colour, either solitary or in pairs at the top of a long naked stalk. Western China. (M. Maurice de Vilmorin, France.)

Astragalus gilgianus, Graebner. (*N. B.* 1896, 185.) Leguminosæ. H. A perennial with silvery leaves and deep ray-violet flowers. Nearly related to *A. cretaceus*, *A. oxytropifolius* and *A. eriophyllus*. Asia Minor. (Berlin B. G.)

Baccharis trimera, DC. (*R. H.* 1896, 152, ff., 50–2.) Compositæ. G. A leafless shrub attaining a height of 6 ft. with winged expansions along the stems. Flower-heads small, inconspicuous. Argentina. (Ed. André, France.)

Begonia acerifolia. (*Veitch Cat.* 1896, 51.) Begoniaceæ. A garden hybrid between *B. Burkei* and *B decora*. (J. Veitch & Sons.) [There is a species called *acerifolia*, H. B. K., native of Ecuador.]

***Begonia carminata.** (*Veitch. Cat.* 1896, 2.) G. A garden hybrid between *B. coccinea* and *B Dregei*. (J. Veitch & Sons.)

***Begonia odoratissima,** Lemoine. (*Lem. Cat.* 1896, 49.) A race of tuberous rooted Begonias with fragrant flowers. (V. Lemoine & Son, Nancy.)

Begonia Rex × decora. (*Jard.* 1896, 267, f. 123.) S. A series of hybrids raised from the two parents above-mentioned is described. (MM. Cappe, France.)

***Begonia umbraculifera,** Hook f. (*B. M.* t. 7457.) S. A remarkable plant both in habit and in having hermaphrodite flowers. A tall species with alternate large reniform or peltate leaves and crowded corymbs of chiefly male white flowers with a few female and bisexual ones. Brazil. (F. Sander & Co.)

Berberis pruinosa, Franchet. (*G. and F.* 1896, 67.) Berberideæ. H. A dwarf shrub "the new growth, the underside of the leaves and the abundant berries being all pure white, and the flowers sulphur yellow." Yunnan.

Bertonerila. (*Lind. Cat.* 1896, 7, ff.) Melastomaceæ. Several varieties of a hybrid between *Bertolonia* and *Sonerila* are here described and figured. (L'Horticulture Internationale, Brussels.)

Billbergia Binoti, R. Gérard. (*J. H. F.* 1896, 724.) Bromeliaceæ. S. A species near *B. speciosa*, Thunb. Leaves in a rosette, deep green above, lower portion tinted with reddish-purple, under surface light green lined with white. Inflorescence pendulous, stem, bracts, &c. red. Organ Mountains, Brazil. (Lyons B. G.)

***Bocconia microcarpa,** Maxim. (*Gard.* 1896, L., 197.) Papaveraceæ. H. A handsome species attaining the height of 9 ft. The inflorescence forms a plume-like panicle, not unlike the Venetian Sumach. N. China. (Kew.)

Brodiæa ixioides erecta. (*Gard.* 1896, xlix., 454.) Liliaceæ. A form with large trusses of bright yellow flowers. (Wallace & Son.)

Brodiæa Orcuttii, Baker. (*G. C.* 1896, xx., 214, f. 40.) H. A bulb bearing umbels of 5–15 bright lilac flowers on a scape 1 ft. long. San Diego Country. (Wallace & Son.)

***Bryanthus Breweri,** A. Gray. (*M. D. G.* 1896, 19.) Ericaceæ. H. A

charming dwarf evergreen shrub with crowded narrow leaves, and short racemes of purple-red flowers. California.

Bulbophyllum attenuatum, Rolfe. (*K. B.* 1896, 45.) Orchideæ. S. A new species with a flower scape 9 in. long, bearing flowers an inch across and coloured purple. Borneo. (L'Horticulture Internationale, Brussels.)

***Bulbophyllum longiscapum,** Rolfe. (*K. B.* 1896, 45.) S. A new species with ovoid pseudobulbs an inch long, linear oblong leaves 4 in. long, scapes over a foot long and flowers an inch across coloured light green with a red-purple lip. Fiji. (Kew.)

Bulbophyllum orthoglossum, Wendl. & Kränzl. (*G. C.* 1896, xix., 326.) S. A new species allied to *B. mandibulare*, which it resembles in pseudobulbs, leaves and flowers, but they are only half as large. The flowers are yellowish green with brown stripes, the lip purple. Saranga Island. (Herrenhausen.)

Bulbophyllun tremulum, Wight. (*G. C.* 1896, xix., 593.) G. Pseudobulbs subglobose, leaf ovate-lanceolate 2 in. long; raceme 6 in. long bearing a few flowers 1½ in. diameter white with red-purple lines and lip, the latter fringed with long hairs. Nilghiri Hills. (C. J. Lucas.)

***Caesalpinia bicolor,** C. H. Wright. (*K. B.* 1896, 22, 223.) Leguminosæ. S. A new species, forming a tree 20 ft. high; the branches thorny, the leaves bipinnate, the flowers red-purple, and the fruit a flat broad pod 2 in. long. Yields a very fine Brazil-wood, valuable for dye purposes. South America. (Kew.)

Calanthe albata. (*G. C.* 1896, xx., 602.) Orchideæ. S. A garden hybrid between *C. veratrifolia* and *C. Cooksoni*. (F. Sander & Co.)

Calanthe Cooksonii. (*Sand. Cat.* 1896, 3.) S. A garden hybrid with white flowers; parentage not stated. (F. Sander & Co.)

***Calochortus nitidus,** Dougl. (*Gard.* 1896, L., 11.) Liliaceæ. H. A distinct species, mauve in colour with a white flush, and a blotch of indigo blue on each segment; bearded at the base. California. (Wallace & Son.)

Campanula balchinensis. (*Gard.* 1896, L., 217.) Campanulaceæ. H. A garden hybrid between *C. fragilis* and *C. isophylla alba.* (Balchin & Sons.)

***Campanula regina,** Alboff. (*G. C.* 1896, xix., 648.) [This is *C. mirabilis*, Alboff.]

Carrieria calycina, Franch. (*R. H.* 1896, 497, f. 170.) Bixineæ. H. A tree attaining a height of about 50 ft., with the general aspect of *Idesia polycarpa*, but with a woody capsular fruit. China. (Paris B. G.)

Catasetum semiroseum, G. Beck. (*W. G.* 1896, 424, t. 4.) Orchideæ. S. Petals and sepals whitish or bright red; lip greenish white, carmine-coloured at the base. One of the numerous varieties of the natural hybrid *C. splendens*, Cogn.

***Catasetum splendens,** Cogn. (*L.* 1896, tt. 502–3.) S. A number of forms of this natural hybrid are figured in above work under the following names: *rubrum, macrocarpum luteoroseum, albo-purpureum, acutipetalum.* (L'Horticulture Internationale, Brussels.)

Catasetum splendens aureo-maculatum. (*Ill. H.* 1896, 91, t. 54.) S. A form with yellow flowers spotted with rich red-brown. (L'Horticulture Internationale, Brussels.)

Cattleya bicolor Lewisii. (*G. C.* 1896, xx., 310.) Orchideæ. G. A variety with emerald green sepals and petals and white lip stained with deep purple. (E. Ashworth.)

Cattleya granulosa Banneri. (*O. R.* 1896, 244.) G. A variety with the sepals and petals suffused with bright lurid purple, the flower measuring 6 in. across. (S. Banner.)

Cattleya intermedio - Loddigesii (*G. C.* 1896, xix., 593.) G. A supposed natural hybrid between the two species indicated in the name. (Hon. W. Rothschild.)

Cattleya intermedio-flava. (*R. H.* 1896, 549.) G. A garden hybrid between *Cattleya intermedia* and *Laelia flava*. (M. L. Fournier, Marseilles.)

Cattleya lauremossiæ. (*G. C.* 1896, xix., 468.) G. A garden hybrid between *C. lawrenciana* and *C. Mossiæ*. (R. B. White.)

Cattleya luddemanniana Ernstii. (*G. C.* 1896, xix., 655.) Flowers larger and richer in colour than those of the type. (H. S. Leon.)

Cattleya Mathoniæ, L. Lind. (*L.* 1896, t. 539.) A supposed natural hybrid between *C. Mossiæ* and *C. luddemanniana*. (L. Linden & Co., Moortebeek, Belgium.)

Cattleya maxima floribunda. (*L.* 1896, t. 506.) A fine form with bright rose-coloured flowers, lip crimson purple with crisped edges margined with white. (L'Horticulture Internationale, Brussels.)

Cattleya Mendelii balliana. (*Sand. Cat.* 1896, 5.) G. Remarkable for the large size and rich colour of the flowers. (F. Sander & Co.)

Cattleya super-Forbesi. (*G. C.* 1896, xx., 90.) G. A garden hybrid between *C. superba* and *C. Forbesii*. (J. Cypher.)

Cattleya Trianæ. (*L.* 1896, tt. 530–1.) A series of varieties are figured and described; *festiva, regalis, dulcis, amplissima, superba, ardens, splendens, majestica.* (L. Linden & Co., Mortebeek, Belgium.)

Cattleya Trianæ atrata. (*J. O.* 1896, 40.) A form with large flowers; sepals and petals very pale rose, the rounded lip very deeply coloured. (L'Horticulture Internationale, Brussels.)

***Celmisia Munroi**, Hook. f. (*B. M.* t. 7496.) Compositæ. G. Whole plant except the upper surface of the leaves and florets, clothed with a snow-white cottony appressed wool. Stem short, crowned with a thick mass of erect and recurved linear-lanceolate leaves. Scapes erect, one-flowered. Head one to two and a half inches across, disc-florets golden yellow, ray-florets white. New Zealand. (J. Veitch & Sons.)

Chamædorea gratissima, L. Lind. (*Lind. Cat.* 1896, 13.) Palmæ. S. Described as an elegant species of robust habit with large leaves resembling those of *C. Verschaffeltii*. Habitat not given. (L'Horticulture Internationale, Brussels.)

***Chirita hamosa**, C. B. Clarke. (*R. H.* 1896, 184, t.) Gesneraceæ. S. An interesting species with peduncle adnate to the leaf-stalk. Flowers lilac blue, showy. India. (J. Sallier, Paris.)

Cirrhopetalum graveolens, Bailey. (*O. R.* 1896, 308.) Orchideæ. S. A large flowered species with leaves 12 in. by 5 in., scapes 6 in. high, raceme 7 in. across, composed of about 13 strongly-scented flowers, yellowish-green speckled with red, lip reddish-brown changing to deep purple. New Guinea. (Brisbane Bot. Gard.) [This is supposed to be identical with *C. robustum*, Rolfe.]

Cirsium Velenovskyi, Hort. (*W. G.* 1896, 76, ff. 6, 7.) Compositæ. H. A biennial, during first year with leaves extremely like those of *Chamaepeuce diacantha*. The second year the flowering stems develop to a height of 4½ ft. and bear numerous large beautiful red flower-heads. Origin not stated. (V. Mašek, Bohemia.)

Clematis Addisonii, Britton. (*G. and F.* 1896, 324, f. 43.) Ranunculaceæ. H. A near ally of *C. Viorna*: sepals dark violet-purple, except at the acute reflexed yellow tips. Alleghany Mountains. (Professor C. S. Sargent, Brookline, Mass., U.S.A.)

Clematis Suksdorfii, Robinson. (*G. and F.* 1896, 255, f. 36.) H. "This little-known Clematis of the Flammula section resembles in habit and foliage the widely distributed and variable *C. ligusticifolia*." N. West. United States.

***Cœlogyne balfouriana.** (*Sand. Cat.* 1896, 6.) Orchideæ. G. Described as a free flowering and distinct species, the flowers being coloured cinnamon, orange, and white, and borne on long arched spikes. Habitat not stated. (F. Sander & Co.)

Cœlogyne lauterbachiana, Kränzl. (*N. B.* 1896, 113.) S. A species allied to *C. carnea*, but differing in having more than one leaf to a bulb, in the form of the lip and in the shorter inflorescence. New Guinea. (Berlin, B. G.)

Cœlogyne lurida, L. Lind. & Cogn. (*L.* 1896, 80; t. 532.) S. Sepals and petals a rather greenish-yellow tinged with purple, lip 3-lobed, white and purplish. Origin not stated. (L'Horticulture Internationale, Brussels.)

Cœlogyne virginalis, L. Lind. (*G. and F.* 1896, 144.) S. A provisional name for an imported plant described as having pure white flowers in the way of *C. cristata*, and deliciously fragrant. Habitat not recorded. (L'Horticulture Internationale, Brussels.)

***Coffea stenophylla**, G. Don. (*B. M.* t. 7475.) Rubiaceæ. S. "An interesting plant, one of the two indigenous West African species which, in point of commercial value, may prove a formidable rival of the Arabian." Sierra Leone. (Kew.)

***Colchicum byzantinum** var. **ciliicum.** (*Gfl.* 1896, 172.) Liliaceæ. H. A handsome variety with flowers as

large as those of *C. speciosum*. Asia Minor. (Kew.)

Colchicum fascicularis, L. (*Gard.* 1896, xlix., 89.) H. The foliage and flowers of this species appear together, the latter being crocus-like in shape and pink and white in colour. Greece. (T. Smith, Newry.)

Coleus spicatus Rondinella. (*Gfl.* 1896, 358, f. 62.) Labiatæ. G. A bushy herbaceous plant about 8 in. high, with fleshy leaves and racemes of blue flowers. Abyssinia. (Dammann & Co., Naples.)

Colutea longialata, Koehne. (*M. D. G.* 1896, 49.) Leguminosæ. H. A species nearly related to *C. arborescens*. Probably a native of the Balkan Peninsula or Asia Minor. (L. Späth, Berlin.)

***Comanthosphace japonica**, S. Moore. (*B. M.* t. 7463.) Labiatæ. H. A small undershrub with hoary branches, ovate-lanceolate dark green leaves and erect terminal spikes of small yellow flowers with long exserted stamens. Japan. (Arnold Arboretum.)

***Coriaria japonica**, A. Gray. (*B. M.* t. 7509.) Coriarieæ. H. The most interesting feature of this Coriaria is the colour of the flowering and fruiting petals, which varies from cherry- to coral-red, that of all other known species being black or violet-black. Japan. (Arnold Arboretum.)

Cornus alba Rosenthali. (*M. D. G.* 1897.) Cornaceæ. A form with variegation similar to C. Spaethii. (H. Albern, Vienna.)

***Cornus corynostylis**, Koehne. (*Gfl.* 1896, 286.) H. A Himalayan species nearly allied to *C. macrophylla*, Wall.

***Coronilla cappadocica**, Willd. *Gard.* 1896, L., 117.) Leguminosæ. H. A species of prostrate habit. Flowers golden yellow in numerous racemes. Asia Minor. (E. Whittall, Smyrna.)

Cotyledon Purpusii, K. Schumann. (*N. B.* 1896, 161.) Crassulaceæ. H. Nearly allied to *Echeveria farinosa*, but differing in the narrow, angled, pyramid-formed, red not yellow corollas. Sierra Nevada. (Ernest Bernary, Erfurt.)

***Crassula aloides**, N. E. Br. (*K. B.* 1896, 161.) Crassulaceæ. S. A new species with the appearance of an Aloe, the leaves being green, fleshy, a foot or more long, 2 in. wide at the base. The flower-scape is 3–4 ft. high bearing a corymb 18 in. across of small pale yellow flowers. Transvaal. (Kew.)

Crinum Lesemanni, G. Beck. (*W. G.* 1896, 125, t. 1.) Amaryllideæ. H. H. A garden hybrid between *C. longiflorum* and *C. Moorei* (*makoyanum*). Identical with *C. Powellii*, a hybrid of the same parentage. (H. Lesemann, Vienna.)

Cucurbita andreana, Naudin. (*R. H.* 1896, 542, ff. 184–7.) Cucurbitaceæ. G. A new species with long stems rooting at the nodes, large leaves marbled with white, flowers only half the size of those of the common pumpkin, and obovoid fruit marked with white and yellow on a green ground. Uruguay. (Ed. André, France.)

Cupressus goweniana compacta, Ed. André. (*R. H.* 1896, 8, f. 1.) Coniferæ. H. H. A form differing from the type in its dense, compact, pyramidal habit. (M. Allard, Angers.)

Cymbidium Lowio - eburneum. (*G. C.* 1896, xix., 337.) Orchideæ. G. A garden hybrid between the species indicated in the name. The reverse cross (*eburneo-lowianum*) was raised by Messrs. J. Veitch & Sons in 1889.

Cypripedium Argo-Stonei. (*G. C.* 1896, xx., 554.) Orchideæ. A garden hybrid between the two species indicated by the name. (N. C. Cookson.)

Cypripedium Chapmani. (*G. C.* 1896, xx., 667.) A garden hybrid between *C. Curtisii* and *C. bellatulum*. (N. C. Cookson.)

Cypripedium concolor var. **longipetalum**, Rolfe. (*O. R.* 1896, 54.) A variety with petals 2½ in. long. (R. B. White.)

Cypripedium goultenianum. (*Sand. Cat.* 1896, 23.) A garden hybrid between *C. Curtisii* and *C. callosum*. (F. Sander & Co.)

Cypripedium insigne, Wall. (*L.* 1896, t. 510.) The following varieties are figured in work just mentioned: *moortebeekiense*, *miniatum*, *latimaculatum*, *lucidum*, *rubidum*, *albo-marginatum*. (L'Horticulture Internationale, Brussels.)

Cypripedium insigne Luciani. (*L.* 1896, t. 505; *Ill. H.* 1896, 11, t. 49.) G. A form with yellow lip and petals; upper sepals broadly margined with white. (L'Horticulture Internationale, Brussels.)

Cypripedium lawrencianum var. **viride**, L. Lind. (*L.* 1896, t. 546.) A variety with flowers much greener than the type. (L'Horticulture Internationale, Brussels.)

Cypripedium Lawrenceo-Regnieri. (*L.* t. 504.) A garden hybrid between the two species indicated by the name. (M. Bleu, Paris.)

Cypripedium palatinum. (*W. G.* 1896, 105.) A garden hybrid between *C. spicerianum* and *C. harrisianum.*

Cypripedium Reginæ. (*G. C.* 1896, xx., 534.) A garden hybrid between *C. leeanum* and *C. fairieanum.* (J. Veitch & Sons.)

Cypripedium regnaldianum. (*Sand. Cat.* 1896, 24.) A garden hybrid between *C. insigne* and *C. callosum.* (F. Sander & Co.)

Cypripedium rothwellianum. (*G. C.* 1896, xx., 310.) A garden hybrid between *C. Stonei* and *C. Argus.* (F. Sander & Co.)

Cypripedium Sanderæ, Sander. (*G. and F.* 1896, 141.) A provisional name for an imported plant described as having a large spear-shaped dorsal sepal coloured crimson, yellow and green, broad petals coloured yellow and red, and a long narrow yellow pouch. Habitat not stated. (F. Sander & Co.)

Cypripedium schofieldianum. (*G. M.* 1896, 283, f.) A garden hybrid between *C. bellatulum* and *C. hirsutissimum.* (G. W. Schofield.)

Cypripedium Symondsiæ. (*O. R.* 1896, 16.) A garden hybrid probably between *C. venustum* and *C. purpuratum.* (H. J. Ross, Florence.)

Cypripedium villosum Truffautii. (*G. C.* 1896, xix., 104.) Leaves broader and flowers larger than in the type. (M. A. Truffaut, Versailles.)

Cyrtanthus obliquus major. (*Sand. Cat.* 1896, 57.) Amaryllideæ. G. Apparently an additional name for the type. South Africa. (F. Sander & Co.)

Cyrtochilum micranthum, Kränzl. (*G. C.* 1896, xx., 63.) Orchideæ. S. A new species resembling *C. maculatum*, but smaller, with greenish spotted sepals and petals and the lip white with two brown blotches and a yellow anterior. Brazil. (F. Sander & Co.)

Cytisus glabrescens, Sartorelli. (*M. D. G.* 1896, 25.) Leguminosæ. H. A small bush with bright yellow flowers produced in May. Mountains of Upper Italy. (L. Späth, Berlin.)

Davallia truffautiana. (*G. M.* 1896, 352, f.) Filices, G. "A particularly handsome and distinct species with large spreading fronds, a peculiarity of which is that the under surface is like the upper." (L'Horticulture Internationale, Brussels.)

***Debregeasia velutina,** Gaud. (*R. H.* 1896, 321, f. 118.) Urticaceæ. G. A shrub attaining a height of 6 to 9 ft. with stalked lanceolate, serrate leaves and shortly-stalked heads of fruit about the size of a pea, of a bright red colour. East Indies. (Paris B. G.)

Delphinium tatsiensis, Franch. (*W. G.* 1896, 27.) Ranunculaceæ. H. A species about 2 ft. in height with cobalt-blue flowers. China. (Vilmorin, Andrieux, & Co., Paris.)

Dendrobium Arachnites, Reichb. f. (*G. C.* 1896, xx., 7, f. 2.) Orchideæ. G. A dwarf species, the pseudobulbs only 3 in. long, fusiform, shining, flowers 1½ in. across, orange-scarlet; sepals and petals linear, lip pandurate. Burma. (J. Bradshaw.)

Dendrobium chloropterum. (*G. C.* 1896, xix., 792.) G. Allied to *D. macrophyllum*; flowers greenish with a few purple lines on the lip. Australia. (H. Low & Co.)

Dendrobium Curtisii. (*Sand. Cat.* 1896, 12, f.) G. A garden hybrid between *D. aureum* and *D. Cassiope.* (F. Sander & Co.)

Dendrobium cymbidioides. (*G. C.* 1896, xix., 581, f. 90.) S. Allied to *D. Cœlogyne.* Pseudobulbs ovate, clustered; leaves linear-lanceolate, 6 in. long; scapes 9 in. erect, many flowered; flowers 2 in. across; sepals and petals narrow creamy-white; lip small white with purple markings. Java. (Sir Trevor Lawrence.)

Dendrobium holmesianum. (*G. C.* 1896, xix., 401.) G. A garden hybrid between *D. dominianum* and *D. schneiderianum.* (F. Hardy.)

Dendrobium jennyanum, Kränzl. (*G. C.* 1896, xx., 329.) G. A new species allied to *D. undulatum* from which it differs in the size of the plant and the flowers which have untwisted segments and a broad three-lobed lip. The colour is yellowish outside, brown inside and varnished. ? Australia. (Zollinger-Jenny, Zurich.)

***Dendrobium quadrilobum**, Rolfe. (*K. B.* 1896, 44.) S. A new species of the section *Cadetia* with creeping stems, short oblong one-leaved pseudobulbs and solitary terminal flowers an inch across, coloured whitish-green. ? New Guinea. (Kew.)

Dendrobium thyrsiflorum Lowii. (*G. C.* 1896, xix., 593.) Flowers creamy-white, lip narrow, spoon-shaped and streaked with yellow. (Baron Schroëder.)

Dendrobium Wiganiæ. (*G. C.* 1896, xix., 337, 553, f. 84). G. A garden hybrid between *D. signatum* and *D. nobile.* (Sir F. Wigan.)

Didymocarpus malayana, Hook. f. (*G. C.* 1896, xx., 123, f. 24; *B. M.* t. 7526.) Gesneraceæ. S. A new species, with ovate acuminate green leaves overlaid with a covering of white silvery hairs. Scapes numerous, erect 4–6 in. high, each bearing two to four flowers which are shaped like those of *Streptocarpus Rexii* but are of a primrose yellow colour. Penang. (J. Veitch & Sons.)

Digitalis campanulata. (*G.* 1896, 163.) Scrophularineæ. H. This represents a fine garden race of the common foxglove, *D. purpurea.* (Vilmorin, Andrieux, & Co., Paris.)

Dioscorea Fargesii, Franchet. (*R. H.* 1896, 540.) Dioscoreaceæ. H. A new species with edible tubers. The general botanical characters approach those of *D. pentaphylla.* Western China. (M. Maurice de Vilmorin, France.)

Dipladenia Sanderi, Hemsley. (*G. C.* 1896, xx., 652.) Apocynaceæ. S. A new species allied to *D. eximea.* Leaves thick, oblong, acuminate 2 in. long, petiole ½ in. long; flowers 3 in. long and wide, rose-coloured. Brazil. (F. Sander & Co.)

Disa pulchra, Sonder. (*G. C.* 1896, xx., 778.) Orchideæ. G. Described in 1847 but never before flowered in cultivation. Tubers large; stems 2 ft., leafy; raceme erect, 6 in. long; flowers 2 in. across, coloured pale lilac and purple; spur, including base of perianth-tube, 2 in. long. S. Africa. (Hon. W. Rothschild.)

***Dischidia hirsuta**, Decne. (*G. C.* 1896, xx., 182.) Asclepiadeæ. S. A slender climber with orbicular fleshy leaves 1 in. diameter and axillary clusters of small red tubular flowers. India and Java. (Kew.)

Dracæna Broomfieldii, Sander. (*G. C.* 1896, xx., 666, f. 115.) Liliaceæ. Leaves 15 in. long, 2 in. wide, green margined and striped with white; stem short jointed an inch in diameter. "South Sea Islands." (F. Sander & Co.)

Dracæna Rigoutsi. (*Ill. H.* 1896, 24, t. 50.) G. A variegated seedling raised from *Cordyline australis.* (M. Rigouts, Belgium.)

Draperia systyla, Torr. (*M. D. G.* 1896, 20.) Hydrophyllaceæ. H. H. A dwarf sub-shrub with long-stalked ovate hairy leaves and cymes of bright violet coloured flowers. California. (Darmstadt B. G.)

Echeveria Purpusi, Schumann. (*Gfl.* 1896, 603, f. 97; *G. C.* 1896, xx., 698, f. 123.) See *Cotyledon Purpusii.*

Echinocactus Odieri var. **Mebbesii**, Hild. (*N. G. M.* 1896, 406, f.) Cacteæ. G. A form differing from the type in its flesh-coloured flowers.

Echinocereus phœniceus var. **inermis.** K. Schum. (*M. K.* 1896, 150, f.) H. A form differing from the type in not having spines. Colorado. (L. Spaeth, Rixdorf-Berlin.)

Epidendrum atrorubens, Rolfe. (*K. B.* 1896, 46.) Orchideæ. G. A new species allied to *E. plicatum.* Leaves linear-oblong 8 in. long, panicle loose, flowers an inch across, red-purple. Mexico. (L'Horticulture Internationale, Brussels.)

Epidendrum elegantulum. (*G. C.* 1896, xix., 361, f. 49.) A garden cross between *E. Endresio-Wallisii* and *E. Wallisii.* (J. Veitch & Sons.)

Epidendrum xipheroides, Kränzl. (*G. C.* 1896, xx., 63.) S. A new species with large pear-shaped pseudobulbs, each bearing two leaves which are linear, thick, 8 in. long, ½ in. wide; raceme slender, few flowered; sepals and petals green with purple lines, lip yellow, with a thick white callus. Brazil. (F. Sander & Co.)

***Eria biflora**, Griff. (*O. R.* 1896, 10.) Orchideæ. G. Plant 6 in. high with two-flowered racemes of whitish yellow flowers. India. (H. J. Elwes.)

***Eria cæspitosa**, Rolfe. (*K. B.* 1896, 194.) G. A new species of tufted habit without pseudobulbs; leaves 2 in. long, flowers very small, white, purple and yellow. Hainan. (Kew.)

Erigeron glabellus var. **mollis,** A. Gray. (*Gard.* 1896, xlix., 81.) Compositæ. H. A pubescent variety with large rose-coloured flowers. Colorado. (L. Späth, Berlin.)

Erigeron hybridus roseus. (*Ill. H.* 1896, 301, f. 26.) H. A garden hybrid between *E. aurantiacus* and *E. Villarsi.* (Haage & Schmidt, Erfurt.)

Erythrina constantiana, Micheli. (*R. H.* 1896, 524, t.; *Gard.* 1896, L., 408.) Leguminosæ. G. The solitary tree which has been named as above exists in the garden of M. A. Constant, Golfe Juan, Alpes Maritimes. It is about 30 ft. high with a trunk 4 ft. in diameter at the base. Branches and trunk covered with persistent spines. Racemes of large scarlet flowers are axillary towards the extremities of the branches. The species is a near ally of *E. caffra.* Origin unknown.

***Erythronium Johnsoni,** Boland. (*G. C.* 1896, xix., 548, f. 83.) Liliaceæ. H. A distinct species, with large reddish-pink flowers, deeper on the outside and a zone of deep pink at the base. Southern Oregon. (Wallace & Son.)

***Eucharis elmetana.** (*Sand. Cat.* 1896, 46.) Amaryllideæ. G. A garden hybrid between *E. Sanderi* and *E. grandiflora.* (H. Kitson.)

Eulophiella peetersiana. (*G. and F.* 1896, 514.) Orchideæ. S. A supposed new species, described as having large rose-coloured flowers on strong axillary spikes. The rhizomes are thin Iris-like and yellowish-white; the leaves are 4 in. in diameter at the base. Madagascar? (F. Sander & Co.)

***Fraxinus anomala,** Torrey. (*M. D. G.* 1896, 26.) Oleaceæ. H. A small tree with leaves most reduced to a single broadly ovate leaflet. Colorado, &c. (Kew.)

Fritillaria Bornmülleri, Hausskn. (*Gard.* 1896, xlix., 282.) Liliaceæ. A species allied to *F. aurea*, and like that species, with golden-yellow flowers. (Barr & Son.)

***Fritillaria nobilis,** Baker. (*B. M.* t. 7500.) H. [Above is correct name for plant described in New Garden Plants of 1895 under the name of *F. kotschyana affinis.*]

Geonoma siesmayeriana, L. Lind. (*Lind. Cat.* 1896, 17.) Palmæ. S. Described as a species of tufted habit with glaucous green leaves which are tinged with red when young. Habitat not given. (L'Horticulture Internationale, Brussels.)

Geophila picta, Rolfe. (*K. B.* 1896, 18.) Rubiaceæ. S. A small prostrate plant with ovate oblong leaves 2 in. long., coloured dull green with a pink mid-rib and pink hairs. Flowers small, white in many-flowered heads. British Guiana. (F. Sander & Co.)

Gerbera viridifolia, Sch. Bip. (*Gard.* 1896, xlix., 162.) Compositæ. H. This species bears white flower-heads $1\frac{3}{4}$ inches in width, on scapes 1 ft. in height. Leaves, inverted, lanceolate with long stalks. S. Africa. (Cambridge B. G.)

***Geum Heldreichii.** (*J. of H.* 1896, xxxii., 487.) Rosaceæ. H. Said to be a variety of *G. montanum* with deep orange red flowers. Greece.

Gongora portentosa var. **rosea,** Cogn. (*L.* 1896, t. 508.) Orchideæ. S. A form with sepals and petals bright rose-purple with small purplish spots, lip citron yellow. United States of Colombia. (L'Horticulture Internationale, Brussels.)

Gongora sanderiana, Kränzl. (*G. C.* 1896, xx., 456.) S. A new species allied to *G. portentosa.* Pseudobulbs conical, 5 in. long; leaves 10 in. long, 2 in. broad; racemes six-flowered; flowers yellowish with rose-coloured spots. Peru. (F. Sander & Co.)

Gutierrezia Euthamiæ, Torr. & Gray. (*M. D. G.* 1896, 26.) Compositæ. H. A suffruticose plant with narrowly-linear leaves and a profusion of small golden-yellow flower-heads. Western United States. (L. Späth, Berlin.)

Habenaria Elwesii, Hook. f. (*B. M.* t. 7478.) Orchideæ. G. This species is most nearly allied to *H. digitata*, differing in the much larger flowers, hairy petals with much longer divisions, long lobes of the lip, and spur-like stigmatic processes. Nilghiri Hills. (H. J. Elwes.)

***Haworthia xiphiophylla,** Baker. (*B. M.* t. 7505.) Liliaceæ. G. This differs from *H. setata* by its narrower thinner leaves, and from *H. arachnoidea* by the leaves not being at all pellucid or lineate. Cape Colony. (Kew.)

Helleborus caucasicus var. **nigricans.** (*Gfl.* 1896, 162.) Ranunculaceæ. H. A form differing from the type in its large bluish-black flowers. (Otto Froebel, Zurich.)

Heuchera sanguinea alba. (*Ill. H.* 1896, 334, f. 32.) Saxifrageæ. H. A.

form differing from the type in having pure white flowers. (Haage & Schmidt, Erfurt.)

*Hibiscus Archeri. (*G. and F.* 1896, 324.) Malvaceæ. G. A garden hybrid between *H. Rosa-sinensis* and *H. schizopetalus*. (Kew.)

Hippeastrum muesserianum, L. Lind. (*Ill. H.* 1896, 376, t. 72.) Amaryllideæ. S. Segments narrow, salmon-colour tinted with rose apparently nearly allied to *H. aulicum*. Brazil. (L'Horticulture Internationale, Brussels.)

*Homalopetalum jamaicense, Rolfe. (*O. R.* 1896, 204.) Orchideæ. S. A new genus allied to *Tetramicra*, remarkable in having the median petal (lip) like the lateral petals. It is of dwarf habit, the rhizomes creeping, pseudobulbs ¼ in. long, leaves ovate, ½ in. long, peduncle 1 in. long, bearing one flower with linear segments ½ in. long. It is figured in *Hooker's Ic. Pl.* t. 2461. Jamaica. (Kew.)

Hoya Lauterbachii, K. Schum. (*M. K.* 1896, 9, f.) Asclepiadeæ. S. A large-flowered species with hairy stems, leaves and flowers; latter dark brown-red inside, emerald green outside. New Guinea.

Idria columnaria, Kellogg. (*B. H. N.* 1896, i., 113.) Tamariscineæ. G. A curious plant with thick pyramidal spiny stems and terminal panicles of straw-coloured flowers. Lower California. (Paris B. G.)

*Iris albopurpurea, Baker. (*B. M.* t. 7511.) Irideæ. H. The nearest ally of this species is *I. hexagona*, a native of the Southern United States. The species was introduced to Kew from Japan with *I. laevigata* from which it differs in having the inner segments erect instead of horizontally spreading. Flowers white, spotted with purple. Japan.

Iris assyriaca, Haussku. (*Gard.* 1896, xlix., 265.) H. A species belonging to the *Oncocyclus* group, bearing white flowers like a large *I. caucasica* in form. (Max Leichtlin, Baden Baden.)

Iris Lortetii alba. (*W. G.* 1896, 137.) H. H. A form differing from the type in its pure white flowers. (Dammann & Co., Naples.)

Iris paravar. Foster. (*J. of H.* 1896, xxxii., 536.) H. A garden hybrid between *I. paradoxa* and *I. variegata*. (M. Foster.)

Isoloma jaliscanum, S. Wats. (*G. and F.* 1896, 496.) Gesneraceæ. G. Stem decumbent, pubescent; leaves oblong-lanceolate 1–3 in. long; flowers in umbels, corolla an inch long, scarlet. Mexico. (Harvard B.G.)

Juniperus virginiana reptans. (*M. G. Z.* 1896, 296, f.; *M. D. G.* 1896, 55.) Coniferæ. H. A prostrate form of value for rockeries, &c. (Jena B. G.)

Juniperus virginiana turicensis. (*Gfl.* 1896, 162.) H. A form of compact, pyramidal habit, and with bluish gray leaves. (Otto Froebel, Zurich.)

*Kendrickia Walkeri, Thw. (*G. C.* 1896, xx., 394.) Melastomaceæ. S. Described as one of the most beautiful of Ceylon plants. It is a climber with creeping ivy-like stems, ovate fleshy grey-green leaves and terminal umbels in large bright red flowers. Ceylon. (Kew.)

Lælia anceps protheroeana. (*G. C.* 1896, xix., 40.) Orchideæ. G. Sepals and petals white at the base, the rest bright rose-purple; lip yellow with purple lines and a crimson-purple front lobe. (J. Broome.)

Laelia autumnalis Fournieri, E. André. (*R. H.* 1896, 547, t.) A large flowered dark coloured variety. (M. L. Fournier, Marseilles.)

Laelia pumila delicata. (*G. C.* 1896, xx., 471.) A variety with nearly pure white flowers. (F. Sander & Co.)

Laelia purpurata ashworthiana. (*G. C.* 1896, xx., 39, f. 10.) A variety with broad petals coloured purple rose and striped with white. (E. Ashworth.)

Laelia purpurata Lewisii. (*G. C.* 1896, xix., 655.) Flowers wholly white, save a few faint lines of lilac-pink on the lip. (W. L. Lewis & Co.)

Laelia purpurata, vars. (*Lind. Cat.* 1896, 47–52.) A number of varieties are here described under such names as *amœna*, *formosa*, *lobata*, &c. (L'Horticulture Internationale, Brussels.)

Laelio-cattleya Ghislainiæ. (*O. R.* 1896, 39.) Orchideæ. G. A garden hybrid between *Laelia harpophylla* and *Cattleya Prinzii*. (A. Van Imschoot, Ghent.)

Laelio-cattleya highburyensis. (*G. C.* 1896, xix., 468.) G. A garden hybrid between *Laelia cinnabarina* and *Cattleya lawrenciana*. (J. Chamberlain.)

Laelio-cattleya velutino-elegans. (*G. C.* 1896, xx., 360.) G. A garden hybrid between the species indicated in the name. (M. Fournier, Marseilles.)

Laelio-cattleya wargnyana. (*L.* 1896, t. 535.) G. A garden hybrid. (L'Horticulture Internationale, Brussels.)

Lanium subulatum, Rolfe. (*K. B.* 1896, 46.) Orchideæ. G. A new species, small in all its parts, the leaves subulate and the flowers pale green. Brazil. (F. Sander & Co.)

Larix dahurica var. **japonica,** Maxim. (*M. D. G.* 1896, 28.) Coniferæ. H. A Larch from Northern Japan with bluish-green leaves. (*L. kurilensis*, Mayr, may be the same as this.) [L. Späth, Berlin.]

***Lavatera insularis.** (*G. and F.* 1896, 164, f. 27.) Malvaceæ. H. H. A compact shrub 4 ft. through with palmately lobed leaves on long petioles and axillary solitary flowers, 2 in. diameter, coloured yellowish-white striped with purple. Mexico. (T. S. Brandegee, California.)

***Ledum glandulosum,** Nutt. (*M. D. G.* 1896, 19.) Ericaceæ. H. This differs from *L. latifolium* and *L. palustre* in its larger ovate leaves, which are not woolly but dotted underneath with impressed glands. Sierra Nevada. (Kew.)

***Lepidotrichum uechtritzianum,** Vel. & Bornm. (*Gard.* 1896, L., 238.) Cruciferæ. H. A prostrate widely-spreading herbaceous plant with white flowers. Bulgaria. (Kew.)

Libocedrus decurrens aureo-variegata. (*M. D. G.* 53.) Coniferæ. H. A form with persistently golden variegated leaves. (Dahs Reuter & Co., Oberpleis, Germany.)

Lilium Biondii, Baroni. (*B. T. O.* 1896, t. vi., 1.) Liliaceæ. H. A scarlet flowered species with linear leaves. Nearly allied to or perhaps identical with *L. sutchuenense*. China. (Florence B. G.)

Lilium chinense, Baroni. *B. T. O.* 1896, 176, t. vi., 2.) H. A scarlet-flowered lily with linear leaves nearly allied to *L. sutchuenense*. China. (Florence B. G.)

Lilium szechnense, Hort. (*G. C.* 1896, xix., 372.) A species with large bright red flowers allied to L. *Maximowiczii*. [*L. sutchuenense*, Franchet, is correct name of this plant.]

***Linospadix Micholitzii,** Ridley. (*Sand. Cat.* 1896, 50.) Palmæ. S. Described in the *Gardeners' Chronicle* 1895, xviii., p. 262, by Mr. Ridley, of Singapore, who says:—"It is unique in the genus in being quite stemless, the wedge-shaped leaves rising erect from the ground in a large tuft. They are upwards of four feet long, narrow at the base, broadening upwards, ending in a pair of long acute points." New Guinea. (F. Sander & Co.)

Lonicera hirsuta × Sullivantii. (*G. and F.* 1896, 345, f. 46.) Caprifoliaceæ. H. A garden hybrid. (Arnold Arboretum.)

***Lowia longiflora,** Scort. (*G. C.* 1896, xx., 652, f. 111.) Scitamineæ. S. A stemless plant with tufted leaves 3 ft. long, and one flowered scapes a foot long. Flowers 6 in. across, composed of three linear-lanceolate spreading olive-coloured sepals and two smaller linear purplish petals tufted at the apex, the third petal being larger, lanceolate, lip-like, and pure white. Perak. (W. Bull.)

Maclura aurantiaca var. **inermis.** Ed. André. (*R. H.* 1896, 33, f. 10.) Urticaceæ. H. A form with larger leaves than the type, and with quite spineless branches. (M. Guy, Bléré, France.)

***Macrotomia cephalotes,** A. DC. *Gfl.* 1896, 173.) Boragineæ. H. A handsome perennial with silvery leaves and large golden yellow flowers. Asia Minor. (Kew.)

***Mamillaria heeseana,** McDowell. (*M. K.* 1896, 125.) Cacteæ. G. This has the longest spines of any species of Mamillaria yet discovered. Plant depressed globose, when young clothed with soft white wool intermixed with weak bristles, naked when old. Flowers carmine-red. Mexico.

Maranta major. (*G. C.* 1896, xix., 529.) Scitamineæ. S. Plant about 3 ft. high with erect long petioles and ovate green leaf-blades. Flowers not known. (J. Veitch & Sons.)

Masdevallia Curlei. (*G. C.* 1896, xix., 40.) Orchideæ. A garden hybrid between *M. macrura* and *M. tovarensis*. (A. Curle.)

***Massonia jasminiflora,** Baker. (*B. M.* t. 7465.) Liliaceæ. G. This plant was discovered at the beginning of the century by the celebrated traveller Burchell, but up till now it has only been known from a single specimen

dried from his garden at Fulham in 1818, and preserved in the Kew Herbarium. Leaves two to a bulb, spreading on the surface of the ground. Umbel of white green tipped flowers sessile in the centre of the two leaves. Orange Free State. (Kew.)

Maxillaria striata grandiflora, Sander. (*G. C.* 1896, xx., 310.) Orchideæ. G. A variety with larger flowers than the type, white with purple lines. (F. Sander & Co.)

***Michauxia Tschihatchewii,** Fisch. & Mey. (*Gfl.* 1896, 173.) Campanulaceæ. H. A handsome biennial attaining a height of six feet and bearing large numbers of white Martagon Lily-like flowers. Radical leaves long-stalked. Asia Minor. (Kew.)

Miltonia bleuiana aurea. (*G. C.* 1896, xix., 337.) Orchideæ. G. Differs from other forms of this hybrid in having clear yellow markings at the base of the lip. (A. A. Peeters, Brussels.)

Morus alba aurea. (*M. D. G.* 1896, 2.) Urticaceæ. H. A form with golden yellow leaves and branches. (T. Rothe, Odessa.)

Morus nigra globosa. (*M. D. G.* 1896, 2.) H. A form of perfectly hemispherical habit. (T. Rothe, Odessa.)

Narcissus triandrus × albicans. (*G. M.* 1896, xxxix., 164. f.) Amaryllideæ. H. A garden hybrid. (G. H. Engelheart.)

***Nepenthes Pervillei,** Blume. (*G. C.* 1896, xx., 239.) Nepenthaceæ. S. A distinct species with short shining-green oblanceolate leaves and dull crimson pitchers 2 in. long. Wild specimens have leaves 12 in. long and pitchers 8 in. Seychelles. (Kew.)

***Nephelaphyllum cristatum,** Rolfe. (*K. B.* 1896, 194.) Orchideæ. S. A new species, allied to *N. cordifolium*; leaves cordate ovate, 2 in. long; scape 10 in. long, few-flowered; flowers ½ in. wide, green with purple lines, lip white in front. Hong Kong. (Kew.)

Nymphæa andreana. (*Gard.* 1896, L., 325.) Nymphæaceæ. H. A garden hybrid or seedling sport. Leaves 8 in. across, slightly spotted with brown. Flowers cup-shaped, 5 in. wide, violet-red. (Latour-Marliac, Temple-sur-Lot, France.)

Nymphæa stellata eastoniensis. (*G. and F.* 1896, 474, f. 68.) S. A seedling variety with numerous broad deep blue petals. (G. Ames, Mass.)

Oberonia Myosurus, Lindl. (*O. R.* 1896, 3.) Orchideæ. G. A small species with terete, fleshy leaves covered with minute pustules. Spike cylindrical: flowers small buff-coloured. Burma. (H. Low & Co.)

Odontoglossum andersonianum Bradshawii. (*O. R.* 1896, 106.) Orchideæ. G. A variety with narrow sepals and petals coloured bright yellow, spotted with red-brown. (H. Low & Co.)

Odontoglossum andersonianum Kitsoni, O'Brien. (*G. C.* 1896, xix., 358.) G. A variety with large broad-petalled well-formed flowers, creamy white, tinged with purple and spotted with red-brown. (J. H. Kitson.)

Odontoglossum concinnum. (*G. C.* 1896, xix., 467.) A supposed natural hybrid with pale yellow flowers blotched and spotted with brown. (L'Horticulture Internationale, Brussels.)

Odontoglossum crispum ashworthianum. (*G. C.* 1896, xix., 196, f. 26; *L.* t. 522.) "Flowers of the largest size covered with blotches of rose and rose-purple." (E. Ashworth.)

Odontoglossum crispum augustum. (*L.* 1896, t. 524; *O. R.* 1896, 196.) A form with very large vinous red blotches. (Dallemagne & Co., Rambouillet, France.)

Odontoglossum crispum calos. (*L.* 1896, t. 118.) G. A form with a large blood-red blotch on the sepals and petals. (L'Horticulture Internationale, Brussels.)

Odontoglossum crispum citratum. (*L.* 1896, t. 521.) G. A form with citron-yellow flowers: lip passing into white at the margin, blotched with brown purple. (L'Horticulture Internationale, Brussels.)

Odontoglossum crispum jumelianum. (*G. C.* 1896, xix., 467.) G. A variety with white flowers blotched with vinous purple. (L'Horticulture Internationale, Brussels.)

Odontoglossum crispum Meleagris. (*L.* 1896, t. 520.) G. A fine form with large pale rosy-lilac sepals and petals shading into white towards the middle; lip large, white, orange yellow in centre, with irregular red spots. (L'Horticulture Internationale, Brussels.)

Odontoglossum crispum var. sulfureum, Rolfe. (*O. R.* 1896, 60.) G.

A variety with the flowers of an uniform sulphur-yellow colour. (R. B. White.)

Odontoglossum crispum venustum. (*G. C.* 1896, xix., 655.) "The best rich crimson-purple blotched Odontoglossum yet seen." Flowers large and full. (L'Horticulture Internationale, Brussels.)

Odontoglossum excellens luteolum. (*O. R.* 1896, 248.) G. A variety with sulphur-yellow flowers without the brown blotches of the type. (Baron Schroeder.)

Odontoglossum Halli × crispum. (*G. C.* 1896, xx., 667.) G. A garden hybrid between the two species indicated by the name. (N. C. Cookson.)

Odontoglossum hunnewellianum grandiflorum. (*L.* 1896, t. 545.) A form with larger flowers and a more brightly-coloured lip than the type. (L. Linden & Co., Moortebeek, Belgium.)

Odontoglossum luteo-purpureum ashworthianum, O'Brien. (*G. C.* 1896, xx., 63.) G. Flowers 5 in. across, sepals broad, reddish brown, with yellow tips, petals broad creamy yellow with red-brown spots; lip fringed yellow with a purple crest. Colombia. (E. Ashworth.)

Odontoglossum Rossi var. **Pauwelsiæ,** *L. Lind.* (*L.* 1896, t. 534.) G. Sepals and lateral petals almost entirely light brown. (M. Fl. Pauwels, Deurne, Belgium.)

Odontoglossum rubiginosum. (*L.* 1896, t. 517.) G. A natural hybrid near *O. wilckeanum.* Flowers light yellow with large chocolate-brown blotches. (L'Horticulture Internationale, Brussels.)

Odontoglossum spectabile. (*G. C.* 1896, xix., 467; *L.* 1896, t. 523.) A supposed natural hybrid resembling *O. excellens*; flowers yellow spotted with chestnut-brown. (L'Horticulture Internationale, Brussels.)

Odontoglossum troyanofskyanum, L. Lind. (*L.* 1896, t. 540.) A supposed natural hybrid between *O. Pescatorei* and *O. triumphans.* (L'Horticulture Internationale, Brussels.)

Odontoglossum varicosum giganteum. (*G. C.* 1896, xix., 655.) G. Flowers much larger than in the type. (Sir F. Wigan.)

Odontoglossum wilckeanum elongatum. (*J. O.* 1896, 40.) G. A variety of this natural hybrid with larger and more brightly-coloured flowers than the type. (L'Horticulture Internationale, Brussels.)

Odontoglossum wilckeanum olivare. (*J. O.* 1896, 40.) A new variety of this natural hybrid with large olive-greenish flowers. (L'Horticulture Internationale, Brussels.)

Odontoglossum wilckeanum rufum. (*L.* 1896, t. 519.) G. A form of this natural hybrid with red-brown blotches. (L'Horticulture Internationale, Brussels.)

***Olyra concinna,** Hook. f. (*B. M.* t. 7469.) Gramineæ. S. A dwarf densely-tufted perennial grass with sessile, almost imbricating, distichous leaves an inch long. Costa Rica. (Kew.)

Oncidium godseffianum, Kränzl. (*G. C.* 1896, xix., 754.) Orchideæ. A new species resembling *O. pubes,* differing in its smaller flowers and in the separation of the lateral sepals. Pseudobulbs 5 in. long, cylindrical, each bearing a pair of linear-lanceolate leaves; flower-scape long, slender, branching. Hab. — ? (F. Sander & Co.)

Opuntia rhodantha, K. Schumann. (*M. D. G.*, 1896, 29.) Cacteæ. H. This has a red corolla and filaments and smooth ovary. Colorado. (L. Späth, Berlin.)

Opuntia tetracantha, J. W. Toumey. (*G. and F.* 1896, 432.) G. A new species allied to *O. Thurberi.* It is a branched shrub 2 to 5 ft. high, the stem and joints cylindrical, covered with prominent tubercles bearing tufts of brown bristles and straw-coloured, flattened, deflexed loosely sheathed spines. Flowers greenish-purple; fruit ovate, bright scarlet. Arizona. (Arizona University.)

Opuntia xanthostema, K. Schumann. (*M. D. G.* 1896, 29.) H. This species has carmine-red flowers, dark yellow filaments and a prickly ovary. Colorado. (L. Späth, Berlin.)

***Ornithogalum revolutum,** Jacq. (*G. and F.* 1896, 323.) Liliaceæ. G. An ally of *O. arabicum,* having narrow leaves 9 in. long, erect scapes 12 in. long, and a sub-umbellate raceme of about 20 flowers, each 1½ in. wide, glistening white with an eye-like blotch of olive brown. S. Africa. (Kew.)

***Palisota Maclaudi,** Cornu. (*J. H. F.* 1896, 466.) Commelynaceæ. S. A near ally of *P. thyrsiflora,* Benth., but

differing in its much longer narrower rather long stalked leaves, by the hairs of the sheaths and stalks being black and not brown, by its more woody stem, &c. Upper Guinea. (Paris B. G.)

Passiflora galbana, M. T. Masters. (*G. C.* 1896, xx., 555, f. 97.) Passifloreæ. S. A new species with entire lanceolate leaves 3 in. long and greenish-yellow flowers 3 in. across. Brazil. (R. Creighton.)

***Pentstemon secundiflorus,** Benth. (*Gard.* 1896, xlix., 478.) Scrophularinæ. H. A pretty species with blue flowers, which are suffused with bronze on the upper surface. Colorado. (Kew.)

***Pentstemon Watsoni,** A. Gray. (*Gfl.* 1896, 77.) H. A dwarf-growing compact species with roundish leaves and racemes of blackish-blue flowers. Colorado. (Herb & Wulle, Naples.)

Perezia sonchifolia, Baker. (*R. H.* 1896, 134, t.) Compositæ. H. A pretty annual with thistle-like leaves and white flower-heads like miniature Camellias. Uruguay. (Ed. André, France.)

Phaius ashworthianus. (*G. C.* 1896, xx., 534.) Orchideæ. S. A garden hybrid between *P. Mannii* and *P. maculatus.* (F. Sander & Co.)

***Phaleria ambigua,** Hook. f. (*B. M.* t. 7471.) Thymetalaceæ. S. A climbing glabrous shrub with light green somewhat leathery leaves and axillary and subterminal heads of pure white scented Daphne-like flowers. Java. (Kew.)

Philodendron robustum, L. Lind. (*Lind. Cat.*, 1896, 21.) Aroideæ. S. Described as a species of extraordinary vigour with large emerald green leaves. Habitat not given. (L'Horticulture Internationale, Brussels.)

***Physurus chinensis,** Rolfe. (*K. B.* 1896, 200.) Orchideæ. S. A new species, with short stem, caespitose ovate green leaves 4 in. long and short scapes bearing numerous small flowers. Kwantung. (Kew.)

Pittosporum eriocarpum, Royle. (*B. M.* t. 7473.) Pittosporeæ. G. A small tree with shortly-stalked leaves and terminal panicles of fragrant golden-yellow flowers. Western Himalaya. (T. Hanbury, La Mortola, Italy.)

Platycerium Veitchii. (*G. C.* 1896, xix., 652.) Filices. G. Described as a "distinct species of stout erect growth, each frond being of unusual leathery substance and dark green in colour." (J. Veitch & Sons.)

Plectocomia crinita, L. Lind. (*Lind. Cat.* 1896, 21.) Palmæ. S. Described as a species with the petioles armed with white spines in fascicles of about seven; leaves pinnate, very large glaucous green, whitish on under side. Habitat not given. (L'Horticulture Internationale, Brussels.)

Polystachya villosa, Cogn. (*J. O.* 1896, 139.) Orchideæ. S. A curious species with flat round disk-like pseudo bulbs furnished with two erect lanceolate-spathulate acute leaves and deep violet-purplish hairy flower-stems bearing somewhat fleshy old gold-coloured flowers more or less tinged with red. Madagascar. (Mme. Adde, Pauillac, France.)

Potentilla dahurica × fruticosa. (*M. D. G.* 1896, 49.) Rosaceæ. H. A hybrid between the two species named. Garden origin.

Potentilla micrandra, Koehne. (*M. D. G.* 1896, 48.) H. A low bush about half as tall-growing as *P. fruticosa* with pinnate leaves and dark yellow flowers. Japan.

Potentilla parvifolia, Fischer. (*M. D. G.* 1896, 26.) H. A dwarf much-branched shrub with yellow flowers produced in July and August. Siberia. (L. Späth, Berlin.)

Primula floribunda grandiflora. (*G.* 1896, 113, t. 1424.) Primulaceæ. H. Differs from the type in having much larger flowers. (Haage & Schmidt, Erfurt.)

Prunus curdica, Fritsch. (*M. D. G.* 1896, 26.) Rosaceæ. H. Intermediate between *P. spinosa* and *P. insititia.* Asia Minor. (L. Späth, Berlin.)

***Prunus subhirtella,** Miquel. (*B. M.* t. 7508.) A small tree, the cherry-like leaves appearing after flowering. Flowers in fascicles of from three to five, white. Japan. (Arnold Arboretum.)

Pteris Childsii. (*G. C.* 1896, xx., 470.) Filices. G. "Fronds compound, pinnæ much subdivided, the tips and margins being percristate." Origin not stated. (T. Childs.)

Pteris Drinkwateri. (*G. C.* 1896, xix., 592.) G. Probably a seedling variety of *P. umbrosa*, with fronds 2 ft. high and pinnæ ¾ in. wide, dark green. (Messrs. Stroud Bros.)

***Pterisanthes polita,** Miq. (*G. C.* 1896, xx., 182.) Ampelideæ. S. A climber

with the habit of a Cissus, cordate leaves 5 in. long and a flower rachis flattened like a knife blade, bearing stalked flowers round the margin and sessile flowers on the surface. Malaya. (Kew.)

Pyrus Malus var. **aurea,** Späth. (*G.* 1896, 169, t. 1425.) Rosaceæ. H. A form with leaves blotched with bright golden yellow. (L. Späth, Berlin.)

Quercus palustris Reichenbachi (*M. D. G.* 1896, 27.) Cupuliferæ. H. A form with the leaves red from their first opening. (H. Wendland, Herrenhausen, Hanover.)

Quercus pedunculata umbraculifera. (*M. D. G.* 1896, 2.) H. A form of broadly globose habit; a seedling raised from acorns of *Q. p. fastigiata.* (L. Frommel, Odessa.)

Restrepia sanguinea, Rolfe. (*K. B.* 1896, 44.) Orchideæ. G. A new species resembling *R. pandurata* but with crimson flowers. The leaves are elliptical, 2 in. long, and the peduncle is of the same length. Colombia. (Charlesworth & Co.)

Rhipsalis robusta, G. A. Lindb. (*M. K.* 1896, 53.) Cacteæ. G. A South Brazilian species with stout terete branches; flowers produced near tips of the stems. (G. A. Lindberg, Stockholm.)

Rhododendron Falconeri × niveum. (*G. C.* 1896, xix., 702.) Ericaceæ. G. A garden hybrid between the two species indicated in the name. Origin uncertain.

Rhododendron halopeanum. (*R. H.* 1896, 359, and 428, t.) H. A garden hybrid between *R. griffithianum* and *R. arboreum.* (M. Halopé, Cherbourg.)

Rhododendron Luscombei splendens. (*G. C.* 1896, xix., 702.) H. Differs from the type in having flowers of a rich crimson colour. (S. C. Godman.)

Rhododendron nobilius. (*G. C.* 1896, xx., 765.) G. A garden hybrid between *R. Teysmanni* and *R. javanicum.* (J. Veitch & Sons.)

Ribes succirubrum. (*M. G. Z.* 1896, 299.) Saxifrageæ. H. A hybrid between *R. divaricatum* and *R. niveum.* (H. Zabel, Gotha.)

Saccolabium Barbeyæ, Kränzl. (*B. B.* 1896, 40). Orchideæ. S. This is *Angræcum imbricatum,* Lindl.

Salix humboldtiana var. **fastigiata,** Ed. André. (*R. H.* 1896, 177, ff. 58–60.) Salicineæ. G. A form of pyramidal habit resembling that of the Lombardy Poplar. Peru, &c. (Ed. André, France.)

***Salvia schiedeana,** Stapf. (*K. B.* 1896, 19.) Labiatæ. G. A new species with hairy stems a foot high and ovate crenate leaves 3 in. long; flower-spike 5 in. long, flowers blue. Mexico. (Kew.)

Sambucus racemosa plumosa aurea. (*M. D. G.* 1896, 27.) Caprifoliaceæ. H. A form of the scarlet-berried elder with finely-cut golden leaves. (De Voss, Holland.)

***Sarcochilus hainanensis,** Rolfe. (*K. B.* 1896, 199.) Orchideæ. S. A new species allied to *S. Arachnites;* stem slender; leaves linear-oblong 4 in. long; raceme 3 in. long; flowers light yellow, sepals and petals $1\frac{1}{2}$ in. long, lip shorter. Hainan. (Kew.)

***Sarracenia Sanderæ.** (*G. C.* 1896, xx., 534.) Sarraceniaceæ. A seedling or hybrid of garden origin. (F. Sander & Co.)

***Saxifraga afghanica,** Aitch. & Hemsl. (*Gard.* 1896, xlix., 260.) Saxifrageæ. H. A distinct plant with white flowers belonging to the Megasea group. Afghanistan. (Kew.)

Sedum englerianum, Graebner. (*N. B.* 1896, 186.) Crassulaceæ. H. A densely-caespitose species probably nearly allied to *S. dasyphyllum* or *S. gypsicolum.* Pyrenees. (Berlin B. G.)

***Senecio multiflorus,** DC. (*G. C.* 1896, xix., 460, ff. 67–69.) Compositæ. G. An ally of the Garden Cineraria (*S. cruentus*). It has a tall leafy stem branched above, with numerous heads of lilac purple flowers 1 in. across. Syn. *Doronicum Bourgæi,* B. M. t. 4994. Canary Islands. (Cambridge B. G.)

Sidalcea malvæflora Listeri. (*Gard.* 1896, L., 131.) Malvaceæ. H. A variety with blush-pink flowers. (Lister.)

Sobralia Brandtiæ, Kränzl. (*G. C.* 1896, xix., 608.) Orchideæ. G. A new species with the habit of *S. macrantha.* Leaf sheaths marked with black spots; flowers from a cone-like head; sepals and petals linear-oblong rose-purple; lip convolute, disk yellow, margins wavy. S. America. (F. Sander & Co.)

Sophora platycarpa, Maxim. (*M. D. G.* 1896, 27.) Leguminosæ. H. In habit and general aspect scarcely distinguishable from *S. japonica,* but differing marked in its fruits. Japan. (L. Späth, Berlin.)

Sophro-Lælia Marriottii. (*G. C.* 1896, xx., 667.) Orchideæ. G. A garden hybrid between *Sophronitis grandiflora* and *Lælia flava.* (Sir W. Marriott.)

Schoenlandia gabonensis, Cornu. (*J. H. F.* 1896, 467.) Pontederiaceæ. S. An acaulescent terrestial plant with cordate acute leaves. The solitary flowers spring from short branches in the axils of the bracts; branches, bracts and flowers being a pale violet colour. Western Tropical Africa. (Paris B. G.)

Selenipedium Verdieri. (*J. O.* 1896, 100.) Orchideæ. A garden hybrid between *S. caudatum Wallisii* and *S. Roezlii.*

Solanum Farini, Hort. (*W. G.* 1896, 405, f. 59.) G. A strong-growing blue-flowered spiny species allied to *S. duplosinuatum.* Africa. (Dammann & Co., Naples.)

Sorbus Aucuparia rossica fructu dulci. (*M. D. G.* 1896, 28.) Rosaceæ. H. A form of the Mountain Ash with edible fruits; introduced from Russia. (L. Späth, Berlin.)

*__Stephanandra Tanakæ,__ Franch. & Savat. (*Gfl.* 1896, 505, t. 1431.) Rosaceæ. H. An interesting and pretty deciduous shrub larger in all its parts than *S. flexuosa.* Japan. (Kew.)

Taxus floridana, Nutt. (*G. and F.* 1896, 261.) Taxaceæ. H. "A bushy tree, rarely 30 ft. high, with a short trunk occasionally a foot in diameter, and many stout, spreading branches." Florida. (Biltmore Arboretum.)

Thunia alba gigantea. (*Sand. Cat.* 1896, 17.) Orchideæ. S. Flowers larger than in the type, pure white, the lip golden yellow. (F. Sander & Co.)

Thuya occidentalis Elwangeriana aurea. (*M. D. G.* 1896, 28.) Coniferæ. H. A form of the American Arborvitæ with golden yellow leaves which do not *burn* during summer. (L. Späth, Berlin.)

Thuya occidentalis Wagneri. (*M. D. G.* 1896, 28.) H. A form of thick, compact, narrow pyramidal habit. (O. Froebel, Zurich.)

Tigridia Pavonia alba immaculata. (*Gard.* 1896, xlix., 361.) Irideæ. A snowy white form without spots. (Van Tubergen, junr., Haarlem.)

*__Tigridia Pavonia flava.__ (*Gard.* 1896, L., 22.) A distinct variety with pale yellow flowers. (Kew.)

Todea arborea bipinnatifida. (*G. C.* 1896, xix., 652.) Filices. G. A variety with finely divided fronds, lighter in colour and more elegant than the type. (J. Veitch & Sons.)

Trichomanes Fraseri, Jenm. (*G. C.* 1890, xx., 266.) Filices. S. A new species with creeping rootstock, small erect pale green naked fronds which are sub-flabellate, ¼ in. long lobed the sori confined to the top lobes. West Indies. (P. Neill Fraser.)

Ulmus campestris umbraculifera nova. (*M. D. G.* 1896, 28.) Urticaceæ. H. This has smaller leaves and a denser habit than *U. c. umbraculifera.* (L. Späth, Berlin.)

*__Utricularia ianthina,__ Hook. f. (*B. M.* t. 7466.) Lentibularieæ. S. A handsome species with reniform leaves and large pale blue corollas, the rounded convex part of the lower lip being marked with two vertical golden bands edged with deep violet. In a wild state grows in the axils of the leaves of a *Vriesia.* Brazil. (F. Sander & Co., St. Albans.)

*__Uvaria virens,__ N. E. Br. (*K. B.* 1896, 16.) Anonaceæ. S. A new species with hairy stems and oblong leaves 3 to 6 in. long; flowers sessile in pairs, small, yellow-green. Delagoa Bay. (Kew.)

Vanda Bensoni var. **tristis,** Parish. (*G. C.* 1896, xix., 422.) Orchideæ. G. A variety with flowers coloured sulphur-yellow outside and dirty brown within, lip whitish yellow with green side-lobes. Moulmien. (F. Sander & Co.)

Vanda bicolor, Griff. (*G. C.* 1896, xix., 422.) G. A rare species recently reintroduced. Stem 3 ft.; leaves 6–10 in. long obtusely two-lobed; scape stout erect, 4–6 flowered, flowers 2 in. diameter, brownish purple, tessellated, lip margined with yellow and with large orbicular side-lobes. Himalaya. (F. Sander & Co.)

Vanda kimballiana var. **Lackneræ,** Kränzl. (*G.* 1896, 337, t. 1428.) S. A form with flowers of a pure white except the small side lobes of the lip which are yellow. (C. Lackner, Steglitz, Germany.)

Vanda teres gigantea. (*G. C.* 1896, xix., 593.) S. A large-flowered richly coloured form with stouter stems and leaves than the type. (Baron Schroëder.)

Viola beckiana, Fiala. (*W. G.* 1896, 197, t. ii.) Violarieæ. H. A handsome rock plant with large blue or yellow flowers. Bosnia.

***Vitis doaniana,** Munsen. (*G. and F.* 1896, 454, f. 59.) Ampelideæ. H. A very hardy vine with hoary white leaves and branches. Texas.

Vitis Solonis robusta. (*W. G.* 1896, 34.) H. A garden hybrid between *V. Solonis* and *V. riparia.* (Besson fils, Marseilles.)

Vriesia mirabile. (*Jard.* 1896, 199.) S. A garden hybrid between *V. hieroglyfica* and *V. cardinalis.* (M. G. Lemaitre, Versailles.)

Vriesia Mortierii. (*R. H.* 1896, 219.) S. A garden hybrid between *Encholirion roseum* and *Vriesia incurvata.* (J. Sallier fils, Paris.)

Vriesia Poelmani. (*R. H. B.* 1896, 229, t.) S. A seedling between *V. splendens* and *V. Van Geerti.* (M. Duval, Versailles.)

Watsonia iridifolia Ardernei. (*G. and F.* 1896, 404.) Irideæ. H. H. A white flowered subvariety of *W. Meriana.* It is identical with *W. iridifolia O'Brieni. See* New Garden Plants for 1889. (R. Wallace & Co.)

Zamia noeffiana, L. Lind. (*Lind. Cat.* 1896, 23.) Cycadaceæ. G. Described as a handsome species allied to *Z. Lindeni* with large fronds, the pinnæ also large and with marginal teeth. S. America. (L'Horticulture Internationale, Brussels.)

Zephyranthes taubertiana, Harms. (*Gfl.* 1896, 281, t. 1427.) Amaryllideæ. G. A species with narrow linear leaves and large pink-tinted flowers. Brazil. (Berlin B. G.)

Zygopetalum Perrenaudii. (*G. C.* 1896, xix., 337, 367, f. 50.) Orchideæ. G. A garden hybrid between *Z. intermedium* and *Z. maxillare Gauthieri.* (A. A. Peeters, Brussels.)

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